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Betten & Resch
Patent- und Rechtsanwälte PartGmbB
Maximiliansplatz 14
80333 München
ALLEMAGNE

Date
26.06.19

Reference	Application No./Patent No.
NBA 038 WO/EP	10828052.0 - 1209 / 2498492
Applicant/Proprietor	
NEC Corporation	

Communication regarding the expiry of the time limit within which notice of opposition may be filed

You are hereby informed that on expiry of the nine-month time limit from the publication of the mention of the grant of European patent No. 2498492 no notice of opposition had reached the files.

The entry in the Register of European Patents will be automatically generated by the electronic data processing system.

For the Examining Division

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EPPU 02: 22.08.18 1209

Peloton - EX1005, Page 1
IPR2023-01239 (Peloton v. NEC)

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Betten & Resch
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ALLEMAGNE

Date
03.09.18

Reference	Application No./Patent No.
NBA 038 WO/EP	10828052.0 - 1209 / 2498492
Applicant/Proprietor	
NEC Corporation	

Transmission of the certificate for a European patent pursuant to Rule 74 EPC

The certificate for a European patent is herewith transmitted.

The European patent specification can be downloaded from the EPO publication server **https://data.epo.org/publication-server/** (see OJ EPO 2005, 126).

Note:
A corrected title page of the European patent specification will be published, if the bibliographic data have been changed after completion of the technical preparations.

For the Examining Division

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Betten & Resch
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Date
26.07.18

Reference	Application No./Patent No.
NBA 038 WO/EP	10828052.0 - 1209 / 2498492
Applicant/Proprietor	
NEC Corporation	

Decision to grant a European patent pursuant to Article 97(1) EPC

Following examination of European patent application No. 10828052.0 a European patent with the title and the supporting documents indicated in the communication pursuant to Rule 71(3) EPC (EPO Form 2004C) or in the information (EPO Form 2004W, cf. Notice from the EPO dated 8 June 2015, OJ EPO 2015, A52) dated 02.03.18 is hereby granted in respect of the designated Contracting States.

Patent No. : 2498492
Date of filing : 13.10.10
Priority claimed : 05.11.09/JPA 2009253581

Designated Contracting States and Proprietor(s) : AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
NEC Corporation
7-1, Shiba 5-chome
Minato-ku
Tokyo 108-8001/JP

This decision will take effect on the date on which the European Patent Bulletin mentions the grant (Art. 97(3) EPC).

The mention of the grant will be published in European Patent Bulletin 18/34 of 22.08.18.

Examining Division

Santos Conde J Hampson F Bardella Parrot X

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Registered letter
EPO Form 2006A 07.15 (19/07/18)

ANMERKUNG ZUR ENTSCHEIDUNG ÜBER DIE ERTEILUNG
EINES EUROPÄISCHEN PATENTS (EPA Form 2006)

1. **EPA Informationsbroschüre "Nationales Recht zum EPÜ"**
Diese Broschüre enthält nützliche Informationen zu den formalen Erfordernissen und den Handlungen, die vor den Patentbehörden der Vertragsstaaten vorzunehmen sind, um Rechte in diesen Staaten zu erlangen. Da diese Handlungen einem ständigen Wandel unterworfen sind, sollte immer nur die neueste Ausgabe der Broschüre benutzt werden. Nachträgliche Informationen werden im Amtsblatt veröffentlicht.

2. **Übersetzung der europäischen Patentschrift nach Artikel 65 (1) des Europäischen Patentübereinkommens**
Sie werden erneut darauf hingewiesen, dass bestimmte Vertragsstaaten nach Artikel 65 (1) EPÜ eine Übersetzung der europäischen Patentschrift verlangen; hierauf wird in der Mitteilung gemäß Regel 71 (5) EPÜ verwiesen. Die Nichteinreichung dieser Übersetzung kann zur Folge haben, dass das Patent in dem betreffenden Staat/in den betreffenden Staaten als von Anfang an nicht eingetreten gilt. Weitere Einzelheiten entnehmen Sie bitte der oben genannten Broschüre.

3. **Zahlung von Jahresgebühren für europäische Patente**
Nach Artikel 141 EPÜ können "nationale" Jahresgebühren für das europäische Patent für die Jahre erhoben werden, die an das Jahr anschließen, in dem der Hinweis auf die Erteilung des europäischen Patents im "Europäischen Patentblatt" bekanntgemacht wird. Weitere Einzelheiten entnehmen Sie bitte der oben genannten Broschüre.

NOTE RELATING TO THE DECISION TO GRANT A
EUROPEAN PATENT (EPO Form 2006)

1. **EPO Information Brochure "National law relating to the EPC"**
This brochure provides useful information regarding formal requirements and the steps to be taken before the patent authorities of the Contracting States in order to acquire rights in those states. Since the necessary steps are subject to change the latest edition of the brochure should always be used. Subsequent information is published in the Official Journal.

2. **Translation of the European patent application under Article 65(1) of the European Patent Convention**
Your attention is again drawn to the requirements regarding translation of the European patent specification laid down by a number of Contracting States under Article 65(1) EPC, to which reference is made in the communication under Rule 71(5) EPC. Failure to supply such translation(s) may result in the patent being deemed to be void "ab initio" in the State(s) in question. For further details you are recommended to consult the above-mentioned brochure.

3. **Payment of renewal fees for European patents**
Under Article 141 EPC "national" renewal fees in respect of a European patent may be imposed for the years which follow that in which the mention of the grant of the European patent is published in the "European Patent Bulletin". For further details you are recommended to consult the above-mentioned brochure.

REMARQUE RELATIVE A LA DECISION DE DELIVRANCE
D'UN BREVET EUROPEEN (OEB Form 2006)

1. **Brochure d'information de l'OEB "Droit national relatif à la CBE"**
Cette brochure fournit d'utiles renseignements sur les conditions de forme requises et sur les actes à accomplir auprès des offices de brevet des Etats contractants aux fins d'obtenir des droits dans les Etats contractants. Etant donné que les actes indispensables sont susceptibles de modifications, il serait bon de toujours consulter la dernière édition de la brochure. Toute information ultérieure est publiée au Journal Officiel.

2. **Traduction du fascicule du brevet européen en vertu de l'article 65(1) de la Convention sur le brevet européen**
Votre attention est de nouveau attirée sur l'obligation faite par certains États contractants, en vertu de l'article 65(1) CBE, de fournir une traduction du fascicule du brevet européen, à laquelle il est fait référence dans la notification établie conformément à la règle 71(5) CBE. Si la(les) traduction(s) n'est(ne sont) pas fournie(s), le brevet européen peut, dès l'origine, être réputé sans effet dans cet(ces) Etat(s). Pour plus de détails, nous vous renvoyons à la brochure susmentionnée.

3. **Paiement des taxes annuelles pour le brevet européen**
Conformément à l'article 141 CBE des taxes annuelles "nationales" dues au titre du brevet européen peuvent être perçues pour les années suivant celle au cours de laquelle la mention de la délivrance du brevet européen est publiée au "Bulletin européen des brevets. Pour plus de détails, nous vous renvoyons à la brochure susmentionnée.

Europäisches Patentamt
European Patent Office
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Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	6511188
Application number	EP10828052.0
Date of receipt	12 July 2018
Receiving Office	European Patent Office, The Hague
Your reference	NBA 038 WO/EP
Applicant	All applicants as on file
Documents submitted	package-data.xml epf1038.pdf (2 p.) ep-sfd-request.xml IGRA-1.pdf\Complete response to 71(3) - for filing.PDF (21 p.)
Submitted by	CN=Verena Sander 55699
Method of submission	Online
Date and time receipt generated	12 July 2018, 09:30 (CEST)
Message Digest	D5:B1:D0:E3:3B:6E:1C:6C:F5:4C:52:6C:E1:CE:BC:BA:6C:AC:A7:F6

Correction by the EPO of errors in debit instructions filed by eOLF
Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

BETTEN & RESCH PATENT- UND RECHTSANWÄLTE PartGmbB

European Patent Office
80298 Munich

July 12, 2018

European Patent Application 10828052.0
"Distribution system"
NEC Corporation
Our File: NBA 038 WO/EP S/VS/S

APPROVAL - TRANSLATIONS - FEES

In response to the Communication under Rule 71(3) EPC:

The text proposed for grant of the above-identified application is approved.

Enclosed please find German and French translations of the claims.

The fee for grant and printing and any possible claim fees and/or page fees (total: 925 €) are paid via the EPO online payment tool.

Franz-Josef Schöniger
Enclosures
- German claims
- French claims

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REVENDICATIONS

1. Système de distribution (100), incluant un dispositif de transmission (110) et un dispositif de réception (120) configurés pour être capables de communiquer l'un avec l'autre,

le dispositif de transmission (110) étant équipé d'un moyen de transmission de contenu (111) pour transmettre des données de contenu, qui sont un contenu codé avec un débit de codage quelconque d'une pluralité de débits de codages différents les uns des autres, au dispositif de réception (120), et

le dispositif de réception (120) étant équipé d'un moyen de reproduction de contenu (121) pour, pendant la réception des données de contenu transmises par le dispositif de transmission (110), stocker des données reçues des données de contenu dans un dispositif de stockage et également reproduire le contenu sur la base des données stockées,

le système de distribution, comprenant un moyen de détermination de débit de codage pour déterminer le débit de codage sur la base d'un temps restant avant un temps de démarrage de reproduction réglé en tant que temps auquel le dispositif de réception (120) démarre la reproduction du contenu depuis un moment présent et sur la base d'un temps de reproduction disponible, qui est un temps disponible pour reproduire le contenu sur la base des données de contenu stockées dans le dispositif de stockage du dispositif de réception (120), dans lequel :

le moyen de transmission de contenu (111) est configuré pour changer le débit de codage des données

de contenu à transmettre au dispositif de réception (120) en le débit de codage déterminé ; et

le moyen de reproduction de contenu (121) est configuré pour démarrer la reproduction du contenu au temps de démarrage de reproduction réglé.

2. Système de distribution selon la revendication 1, dans lequel le moyen de détermination de débit de codage (131) est configuré pour déterminer une valeur, devenant plus petite lorsque le temps de reproduction disponible devient plus court qu'un temps de reproduction disponible cible, qui est une valeur cible du temps de reproduction disponible, et devenant plus petite lorsque le temps restant devient plus court, en tant que débit de codage.

3. Système de distribution selon la revendication 2, dans lequel le moyen de détermination de débit de codage (131) est configuré pour acquérir une vitesse de communication, qui est une quantité de données des données de contenu transmises du dispositif de transmission (110) au dispositif de réception (120) par temps unitaire, et déterminer une valeur d'un résultat de la division d'une valeur d'un résultat de multiplication de la vitesse de communication acquise et du temps restant par une valeur d'un résultat de soustraction du temps de reproduction disponible du temps de reproduction disponible cible, en tant que débit de codage.

4. Système de distribution selon l'une quelconque des revendications 1 à 3, dans lequel le moyen de détermination de débit de codage (131) est configuré pour déterminer le débit de codage avec chaque période de changement réglée à l'avance.

5. Système de distribution selon l'une quelconque des revendications 1 à 4, incluant une pluralité des dispositifs de réception (20a, 20b, 20c),

le système de distribution, comprenant un moyen de commande de reproduction synchrone (32) pour mettre en correspondance des positions de reproduction du contenu à reproduire respectivement par la pluralité des dispositifs de réception (20a, 20b, 20c), à chaque autre dispositif parmi la pluralité des dispositifs de réception (20a, 20b, 20c)

6. Système de distribution selon la revendication 5, comprenant un moyen de réglage de temps de démarrage de reproduction (43) pour régler le temps de démarrage de reproduction sur la base d'un temps de reproduction disponible cible, qui est une valeur cible du temps de reproduction disponible.

7. Système de distribution selon la revendication 5 ou 6, dans lequel le moyen de transmission de contenu (45) est configuré pour, lorsqu'un second temps de démarrage de reproduction, qui est un temps de démarrage de reproduction réglé pour un second dispositif de réception en tant qu'un de la pluralité des dispositifs de réception (20a, 20b, 20c), est

ultérieur à un premier temps de démarrage de reproduction, qui est un temps de démarrage de reproduction réglé pour un premier dispositif de réception en tant qu'autre dispositif de la pluralité des dispositifs de réception (20a, 20b, 20c), estimer une position de reproduction du contenu étant reproduit par le premier dispositif de réception au second temps de démarrage de reproduction et transmettre une partie des données de contenu à et après la position de reproduction estimée au second dispositif de réception.

8. Système de distribution selon la revendication 6 ou 7, dans lequel le moyen de réglage de temps de démarrage de reproduction (43) est configuré pour, pour chaque dispositif de réception de la pluralité des dispositifs de réception (20a, 20b, 20c), calculer un temps de préparation de reproduction de chaque dispositif en tant que temps requis pour que le dispositif de réception (20a ; 20b ; 20c) démarre la reproduction du contenu et règle le temps de démarrage de reproduction sur la base d'une valeur maximale du temps de préparation de reproduction de chaque dispositif calculé.

9. Système de distribution selon l'une quelconque des revendications 6 à 8, dans lequel le moyen de réglage de temps de démarrage de reproduction (43) est configuré pour régler le temps de démarrage de reproduction sur la base d'un temps d'activation, qui est un temps requis pour l'activation d'un programme d'application à exécuter par le dispositif de réception

(20a ; 20b ; 20c) pour la reproduction du contenu, et du temps de reproduction disponible cible.

10. Système de distribution selon l'une quelconque des revendications 6 à 9, dans lequel le moyen de réglage de temps de démarrage de reproduction (43) est configuré pour régler le temps de démarrage de reproduction sur la base d'une vitesse de communication, qui est une quantité de données des données de contenu transmises du dispositif de transmission (10) au dispositif de réception (20a ; 20b ; 20c) par temps unitaire, et du temps de reproduction disponible cible.

11. Procédé de distribution appliqué à un système de distribution incluant un dispositif de transmission et un dispositif de réception configuré pour être capables de communiquer l'un avec l'autre, le procédé de distribution comprenant les données :

transmettre des données de contenu (S503), qui sont un contenu codé avec un débit de codage quelconque d'une pluralité de débits de codage différents les uns des autres, au dispositif de réception, par le dispositif de transmission ;

pendant la réception des données de contenu transmises par le dispositif de transmission, stocker les données reçues des données de contenu dans un dispositif de stockage et également la reproduction du contenu sur la base des données stockées, par le dispositif de réception ;

déterminer le débit de codage (S504) sur la base d'un temps restant avant un temps de démarrage de

reproduction réglé pour le dispositif de réception (120) en tant que temps auquel le dispositif de réception démarre la reproduction du contenu à partir d'un moment présent, et sur la base d'un temps de reproduction disponible, qui est un temps disponible pour reproduire le contenu sur la base des données de contenu stockées dans le dispositif de stockage du dispositif de réception ;

changer le débit de codage (S505) des données de contenu à transmettre au dispositif de réception en le débit de codage déterminé, par le dispositif de transmission ; et

démarrer la reproduction du contenu (S506) au temps de démarrage de reproduction réglé, par le dispositif de réception.

12. Procédé de distribution selon la revendication 11, comprenant :

déterminer une valeur, devenant plus petite lorsque le temps de reproduction disponible devient plus court qu'un temps de reproduction disponible cible, qui est une valeur cible du temps de reproduction disponible, et devenant plus petite lorsque le temps restant devient plus court, en tant que débit de codage.

13. Procédé de distribution selon la revendication 12, comprenant :

acquérir une vitesse de communication, qui est une quantité de données des données de contenu transmises du dispositif de transmission au dispositif de réception par temps unitaire ; et

déterminer une valeur d'un résultat de la division d'une valeur d'un résultat de multiplication de la vitesse de communication acquise et du temps restant par une valeur d'un résultat de soustraction du temps de reproduction disponible du temps de reproduction disponible cible, en tant que débit de codage.

14. Procédé de distribution selon l'une quelconque des revendications 11 à 13, comprenant :

déterminer le débit de codage avec chaque période de changement réglée à l'avance.

15. Procédé de distribution selon l'une quelconque des revendications 11 à 14, appliqué au système de distribution incluant une pluralité des dispositifs de réception, le procédé de distribution comprenant :

mettre en correspondance les positions de reproduction du contenu à reproduire respectivement par la pluralité des dispositifs de réception, à chaque autre dispositif parmi la pluralité des dispositifs de réception.

16. Dispositif de transmission (110) configuré pour être capable de communiquer avec un dispositif de réception (120), le dispositif de transmission (110) comprenant :

un moyen de transmission de contenu (111) pour transmettre des données de contenu, qui sont un contenu codé avec un débit de codage quelconque d'une pluralité de débits de codage différents les uns des autres, au dispositif de réception (120),

dans lequel le moyen de transmission de contenu (111) est configuré pour changer le débit de codage des données de contenu à transmettre au dispositif de réception (120) en un débit de codage déterminé sur la base d'un temps restant avant un temps de démarrage de reproduction réglé pour le dispositif de réception (120) en tant que temps auquel le dispositif de réception (120) démarre la reproduction du contenu à partir d'un moment présent et sur la base d'un temps de reproduction disponible, qui est un temps disponible pour reproduire le contenu sur la base des données de contenu stockées dans le dispositif de stockage du dispositif de réception (120).

17. Dispositif de transmission (110) selon la revendication 16, comprenant :

un moyen de détermination de débit de codage (131) pour déterminer le débit de codage sur la base du temps restant et du temps de reproduction disponible.

18. Dispositif de transmission (110) selon la revendication 16 ou 17, dans lequel le moyen de détermination de débit de codage (131) est configuré pour déterminer une valeur devenant plus petite lorsque le temps de reproduction disponible devient plus court qu'un temps de reproduction disponible cible, qui est une valeur cible du temps de reproduction disponible, et devenant plus petite lorsque le temps restant devient plus court, en tant que débit de codage.

19. Dispositif de transmission (110) selon la revendication 18, dans lequel le moyen de détermination de débit de codage (131) est configuré pour acquérir une vitesse de communication, qui est une quantité de données des données de contenu transmises du dispositif de transmission (110) au dispositif de réception par temps unitaire, et déterminer une valeur d'un résultat de la division d'une valeur d'un résultat de multiplication de la vitesse de communication acquise et du temps restant par une valeur d'un résultat de soustraction du temps de reproduction disponible du temps de reproduction disponible cible, en tant que débit de codage.

20. Dispositif de transmission (110) selon l'une quelconque des revendications 16 à 19, dans lequel le moyen de détermination de débit de codage (131) est configuré pour déterminer le débit de codage avec chaque période de changement réglée à l'avance.

21. Programme comprenant des instructions pour amener un dispositif de transmission (110) configuré pour être capable de communiquer avec un dispositif de réception (120) à réaliser un moyen de transmission de contenu (111) pour transmettre des données de contenu, qui sont un contenu codé avec un débit de codage quelconque d'une pluralité de débits de codage différents les uns des autres, au dispositif de réception (120),

dans lequel le moyen de transmission de contenu (111) est configuré pour changer le débit de codage des

données de contenu à transmettre au dispositif de réception (120) en un débit de codage déterminé sur la base d'un temps restant avant un temps de démarrage de reproduction réglé en tant que temps auquel le dispositif de réception (120) démarre la reproduction du contenu à partir d'un moment présent, et sur la base d'un temps de reproduction disponible, qui est un temps disponible pour reproduire le contenu sur la base des données de contenu stockées dans le dispositif de stockage du dispositif de réception (120).

22. Dispositif de réception (120) configuré pour être capable de communiquer avec un dispositif de transmission (110), le dispositif de réception (120) comprenant :

un moyen de reproduction de contenu (121) pour, pendant la réception de données de contenu, qui sont un contenu codé avec un débit de codage quelconque d'une pluralité de débits de codage différents les uns des autres et sont transmises par le dispositif de transmission (110), stocker des données reçues des données de contenu dans un dispositif de stockage et également reproduire le contenu sur la base des données stockées ; et

un moyen de détermination de débit de codage (131) pour déterminer le débit de codage sur la base d'un temps restant avant un temps de démarrage de reproduction réglé pour le dispositif de réception (120) en tant que temps pour démarrer la reproduction du contenu à partir d'un moment présent et sur la base d'un temps de reproduction disponible, qui est un temps

disponible pour reproduire le contenu sur la base des données de contenu stockées dans le dispositif de stockage,

dans lequel le moyen de reproduction de contenu (121) est configuré pour recevoir des données de contenu codées avec le débit de codage déterminé et démarrer la reproduction du contenu au temps de démarrage de reproduction réglé.

23. Dispositif de réception (120) selon la revendication 22, dans lequel le moyen de détermination de débit de codage (131) est configuré pour déterminer une valeur devenant plus petite lorsque le temps de reproduction disponible devient plus court qu'un temps de reproduction disponible cible, qui est une valeur cible du temps de reproduction disponible, et devenant plus petite lorsque le temps restant devient plus court, en tant que débit de codage.

24. Dispositif de réception (120) selon la revendication 23, dans lequel le moyen de détermination de débit de codage (131) est configuré pour acquérir une vitesse de communication, qui est une quantité de données des données de contenu transmises du dispositif de transmission (110) au dispositif de réception (120) par temps unitaire, et déterminer une valeur d'un résultat de la division d'une valeur d'un résultat de multiplication de la vitesse de communication acquise et du temps restant par une valeur d'un résultat de soustraction du temps de reproduction disponible du

temps de reproduction disponible cible, en tant que débit de codage.

25. Dispositif de réception (120) selon l'une quelconque des revendications 22 à 24, dans lequel le moyen de détermination de débit de codage (131) est configuré pour déterminer le débit de codage avec chaque période de changement réglée à l'avance.

26. Programme comprenant des instructions pour amener un dispositif de réception (120) selon l'une quelconque des revendications 22 à 25 à communiquer avec un dispositif de transmission (110) selon l'une quelconque des revendications 16 à 20.

PATENTANSPRÜCHE

1. Verteilungssystem (100) mit einer Sendeeinrichtung (110) und einer Empfangseinrichtung (120), die so konfiguriert sind, dass sie miteinander kommunizieren können, wobei

die Sendevorrichtung (110) mit einer Inhaltsübertragungseinrichtung (111) zum Übertragen von Inhaltsdaten, bei denen es sich um einen Inhalt handelt, der mit einer beliebigen Code-Rate einer Vielzahl von Code-Raten, die sich voneinander unterscheiden, codiert ist, an die Empfangsvorrichtung (120) und

die Empfangsvorrichtung (120) mit einer Inhaltswiedergabeeinrichtung (121) ausgestattet ist, um während des Empfangs der von der Sendevorrichtung (110) übertragenen Inhaltsdaten die empfangenen Daten der Inhaltsdaten in einer Speichereinrichtung zu speichern und auch den Inhalt auf der Grundlage der gespeicherten Daten wiederzugeben,

das Verteilungssystem mit einer Code-Raten-Bestimmungseinrichtung (131) zum Bestimmen der Code-Rate auf der Grundlage einer verbleibenden Zeit vor Wiedergabestartzeit, die für die Empfangseinrichtung (120) als Zeit, zu der die Empfangseinrichtung (120) die Wiedergabe des Inhalts ab einem gegenwärtigen Zeitpunkt beginnt, und auf der Grundlage einer verfügbaren Wiedergabezeit, die eine Zeit ist, die für die Wiedergabe des Inhalts auf der Grundlage der in der Speichereinrichtung der Empfangseinrichtung (120) gespeicherten Inhaltsdaten verfügbar ist, eingestellt ist, wobei:

die Inhaltsübertragungseinrichtung (111) konfiguriert ist, um die Coderate der an die Empfangseinrichtung (120) zu sendenden Inhaltsdaten auf die bestimmte Coderate zu ändern; und

die Inhaltswiedergabeeinrichtung (121) so konfiguriert ist, dass sie die Wiedergabe des Inhalts zum eingestellten Wiedergabestartzeitpunkt startet.

2. Verteilungssystem nach Anspruch 1, wobei die Code-Raten-Bestimmungseinrichtung (131) konfiguriert ist, um einen Wert zu bestimmen, der kleiner wird, wenn die verfügbare Reproduktionszeit kürzer wird als eine verfügbare

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Soll-Reproduktionszeit, die ein Zielwert der verfügbaren Reproduktionszeit ist, und kleiner wird, wenn die verbleibende Zeit kürzer wird, als die Coderate.

3. Verteilungssystem nach Anspruch 2, wobei die Code-Raten-Bestimmungseinrichtung (131) konfiguriert ist, um eine Kommunikationsgeschwindigkeit zu erfassen, die eine Datenmenge der von der Sendeeinrichtung (110) an die Empfangseinrichtung (120) übertragenen Inhaltsdaten pro Zeiteinheit ist, und einen Wert eines Ergebnisses der Division eines Wertes eines Ergebnisses der Multiplikation der erfassten Kommunikationsgeschwindigkeit und der verbleibenden Zeit durch einen Wert eines Ergebnisses der Subtraktion der verfügbaren Reproduktionszeit von der verfügbaren Zielwiedergabezeit als Coderate zu bestimmen.

4. Verteilungssystem nach einem der Ansprüche 1 bis 3, wobei die Code-Raten-Bestimmungseinrichtung (131) konfiguriert ist, um die Coderate mit jeder im Voraus festgelegten Änderungsperiode zu bestimmen.

5. Das Verteilungssystem nach einem der Ansprüche 1 bis 4, einschließlich einer Vielzahl der Empfangsvorrichtungen (20a, 20b, 20c), wobei

das Verteilungssystem eine synchrone Wiedergabesteuereinrichtung (32) zum Anpassen der Wiedergabepositionen des durch die Vielzahl der Empfangsvorrichtungen (20a, 20b, 20c) wiederzugebenden Inhalts miteinander unter den Vielzahl der Empfangsvorrichtungen (20a, 20b, 20c) aufweist.

6. Verteilungssystem nach Anspruch 5, umfassend eine Einrichtung (43) zum Einstellen der Reproduktionsstartzeit auf der Grundlage einer verfügbaren Reproduktionszeit, die ein Zielwert der verfügbaren Reproduktionszeit ist.

7. Verteilungssystem nach Anspruch 5 oder 6, wobei das Inhaltsübertragungsmittel (45) so konfiguriert ist, dass, wenn die zweite Wiedergabestartzeit, die für eine zweite Empfangsvorrichtung als eine der mehreren Empfangsvorrichtungen (20a, 20b, 20c) eingestellt ist, später als die erste Wiedergabestartzeit ist, die eine Wiedergabestartzeit ist, die für eine erste Empfangsvorrichtung als eine andere aus der Vielzahl der Empfangsvorrichtungen

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(20a, 20b, 20c) eingestellt ist, eine Wiedergabeposition des von der ersten Empfangsvorrichtung zur zweiten Wiedergabestartzeit wiedergegebenen Inhalts schätzt und einen Teil der Inhaltsdaten an und nach der geschätzten Wiedergabeposition an die zweite Empfangsvorrichtung sendet.

8. Verteilungssystem nach Anspruch 6 oder 7, wobei die Wiedergabestartzeit-Einstelleinrichtung (43) konfiguriert ist, um für jede Empfangseinrichtung der Vielzahl der Empfangseinrichtungen (20a, 20b, 20c) eine Wiedergabevorbereitungszeit für jedes Gerät als eine Zeit zu berechnen, die für die Empfangseinrichtung (20a; 20b; 20c) zum Starten der Wiedergabe des Inhalts erforderlich ist, und die Wiedergabestartzeit auf der Grundlage eines Maximalwerts der berechneten Wiedergabevorbereitungszeit für jedes Gerät einzustellen.

9. Verteilungssystem nach einem der Ansprüche 6 bis 8, wobei die Wiedergabestartzeit-Einstelleinrichtung (43) konfiguriert ist, um die Wiedergabestartzeit basierend auf einer Aktivierungszeit, die eine Zeit ist, die für die Aktivierung eines von der Empfangseinrichtung (20a; 20b; 20c) auszuführenden Anwendungsprogramms für die Wiedergabe des Inhalts erforderlich ist, und der verfügbaren Ziel-Wiedergabezeit einzustellen.

10. Verteilungssystem nach einem der Ansprüche 6 bis 9, wobei die Wiedergabestartzeit-Einstelleinrichtung (43) konfiguriert ist, um die Wiedergabestartzeit basierend auf einer Kommunikationsgeschwindigkeit, die eine Datenmenge der von der Sendeeinrichtung (10) an die Empfangseinrichtung (20a; 20b; 20c) übertragenen Inhaltsdaten pro Zeiteinheit ist, und der verfügbaren Zielwiedergabezeit einzustellen.

11. Verteilungsverfahren, das auf ein Verteilungssystem angewendet wird, das eine Sendevorrichtung und eine Empfangsvorrichtung umfasst, die so konfiguriert sind, dass sie miteinander kommunizieren können, wobei das Verteilungsverfahren Folgendes umfasst:

Senden von Inhaltsdaten (S503), bei denen es sich um einen Inhalt handelt, der mit einer beliebigen Code-Rate einer Vielzahl von Code-Raten, die sich voneinander unterscheiden, codiert ist, an das Empfangsgerät durch das Sendegerät;

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während des Empfangs der von der Sendeeinrichtung übertragenen Inhaltsdaten, Speichern der empfangenen Daten der Inhaltsdaten in einer Speichereinrichtung und Wiedergeben des Inhalts auf der Grundlage der gespeicherten Daten durch die Empfangseinrichtung;

Bestimmen der Code-Rate (S504) auf der Grundlage einer für die Empfangsvorrichtung (120) eingestellten Restzeit vor Wiedergabestartzeit als Zeitpunkt, zu dem die Empfangsvorrichtung die Wiedergabe des Inhalts ab einem gegenwärtigen Zeitpunkt beginnt, und auf der Grundlage einer verfügbaren Wiedergabezeit, die eine Zeit ist, die für die Wiedergabe des Inhalts auf der Grundlage der in der Speichervorrichtung der Empfangsvorrichtung gespeicherten Inhaltsdaten verfügbar ist;

Ändern der Code-Rate (S505) der an das Empfangsgerät zu übertragenden Inhaltsdaten auf die ermittelte Code-Rate durch das Sendegerät; und

Starten der Wiedergabe des Inhalts (S506) zur eingestellten Startzeit der Wiedergabe durch das Empfangsgerät.

12. Das Verteilungsverfahren nach Anspruch 11, aufweisend:

Bestimmen eines Wertes, der kleiner wird, wenn die verfügbare Reproduktionszeit kürzer wird als eine verfügbare Soll-Reproduktionszeit, die ein Zielwert der verfügbaren Reproduktionszeit ist, und kleiner wird, wenn die verbleibende Zeit kürzer wird, als die Coderate.

13. Das Verteilungsverfahren nach Anspruch 12, aufweisend:

Erfassen einer Kommunikationsgeschwindigkeit, die eine Datenmenge der von der Sendeeinrichtung an die Empfangseinrichtung übertragenen Inhaltsdaten pro Zeiteinheit ist; und

Bestimmen eines Wertes eines Ergebnisses aus der Division eines Wertes eines Ergebnisses aus der Multiplikation der erfassten Kommunikationsgeschwindigkeit und der verbleibenden Zeit mit einem Wert eines Ergebnisses aus der Subtraktion der verfügbaren Reproduktionszeit von der verfügbaren Ziel-Reproduktionszeit als Code-Rate.

14. Das Verteilungsverfahren nach einem der Ansprüche 11 bis 13, aufweisend:

Bestimmung der Code-Rate bei jeder vorab eingestellten Änderungsperiode.

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15. Das Verteilungsverfahren nach einem der Ansprüche 11 bis 14, das auf das Verteilungssystem angewendet wird, das eine Vielzahl der Empfangsvorrichtungen umfasst, wobei das Verteilungsverfahren umfasst:

Anpassen von Wiedergabepositionen des von der Mehrzahl der Empfangsgeräte jeweils wiederzugebenden Inhalts untereinander unter der Mehrzahl der Empfangsgeräte.

16. Übertragungsvorrichtung (110), die so konfiguriert ist, dass sie mit einer Empfangsvorrichtung (120) kommunizieren kann, wobei die Sendevorrichtung (110) umfasst:

eine Inhaltsübertragungseinrichtung (111) zum Übertragen von Inhaltsdaten, die ein Inhalt ist, der mit einer beliebigen Coderate einer Vielzahl von Coderaten codiert ist, die sich voneinander unterscheiden, an die Empfangseinrichtung (120),

wobei die Inhaltsübertragungseinrichtung (111) so konfiguriert ist, dass sie die Coderate der an die Empfangseinrichtung (120) zu sendenden Inhaltsdaten auf eine Coderate ändert, die auf der Grundlage einer Restzeit vor dem Wiedergabestart, die für die Empfangseinrichtung (120) als Zeitpunkt, zu dem die Empfangseinrichtung (120) die Wiedergabe des Inhalts ab einem gegenwärtigen Zeitpunkt beginnt, und auf der Grundlage einer verfügbaren Wiedergabedauer, die eine Zeit ist, die für die Wiedergabe des Inhalts auf der Grundlage der in der Speichereinrichtung der Empfangseinrichtung (120) gespeicherten Inhaltsdaten verfügbar ist, bestimmt wird.

17. Die Übertragungsvorrichtung (110) nach Anspruch 16, umfassend:

eine Code-Ratenbestimmungseinrichtung (131) zum Bestimmen der Coderate basierend auf der verbleibenden Zeit und der verfügbaren Reproduktionszeit.

18. Übertragungsvorrichtung (110) nach Anspruch 16 oder 17, wobei die Code-Ratenbestimmungseinrichtung (131) konfiguriert ist, um einen Wert zu bestimmen, der kleiner wird, wenn die verfügbare Reproduktionszeit kürzer wird als eine verfügbare Soll-Reproduktionszeit, die ein Zielwert der verfügbaren Reproduktionszeit ist, und kleiner wird, wenn die verbleibende Zeit kürzer wird, als die Code-Rate.

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19. Übertragungsvorrichtung (110) nach Anspruch 18, wobei die Code-Ratenbestimmungseinrichtung (131) konfiguriert ist, um eine Kommunikationsgeschwindigkeit zu erfassen, die eine Datenmenge der von der Übertragungsvorrichtung (110) an die Empfangsvorrichtung übertragenen Inhaltsdaten pro Zeiteinheit ist, und einen Wert eines Ergebnisses der Division eines Wertes eines Ergebnisses der Multiplikation der erfassten Kommunikationsgeschwindigkeit und der verbleibenden Zeit durch einen Wert eines Ergebnisses der Subtraktion der verfügbaren Reproduktionszeit von der verfügbaren Zielwiedergabezeit als Coderate zu bestimmen.

20. Übertragungseinrichtung (110) nach einem der Ansprüche 16 bis 19, wobei die Code-Ratenbestimmungseinrichtung (131) konfiguriert ist, um die Coderate mit jeder im Voraus eingestellten Änderungsperiode zu bestimmen.

21. Programm mit Befehlen, um eine Sendevorrichtung (110), die so konfiguriert ist, dass sie mit einer Empfangsvorrichtung (120) kommunizieren kann, zu veranlassen, eine Inhaltsübertragungseinrichtung (111) zum Übertragen von Inhaltsdaten, die ein Inhalt sind, der mit einer beliebigen Code-Rate aus einer Vielzahl von Code-Raten, die voneinander verschieden sind, an die Empfangsvorrichtung (120) codiert ist, zu realisieren,

wobei die Inhaltsübertragungseinrichtung (111) konfiguriert ist, um die Coderate der an die Empfangseinrichtung (120) zu sendenden Inhaltsdaten auf eine Coderate zu ändern, die auf der Grundlage einer Restzeit vor Wiedergabestartzeit, die für die Empfangseinrichtung (120) als Zeit, zu der die Empfangseinrichtung (120) die Wiedergabe des Inhalts ab einem gegenwärtigen Zeitpunkt beginnt, und auf der Grundlage einer verfügbaren Wiedergabedauer, die eine Zeit ist, die für die Wiedergabe des Inhalts auf der Grundlage der in der Speichereinrichtung der Empfangseinrichtung (120) gespeicherten Inhaltsdaten verfügbar ist, bestimmt wird.

22. Empfangsvorrichtung (120), die so konfiguriert ist, dass sie mit einer Sendevorrichtung (110) kommunizieren kann, wobei die Empfangsvorrichtung (120) umfasst:

eine Inhaltswiedergabeeinrichtung (121), um während des Empfangs von Inhaltsdaten, die ein Inhalt sind, der mit einer beliebigen Coderate einer Vielzahl von

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Codegeraten, die sich voneinander unterscheiden, codiert ist und von der Sendeeinrichtung (110) übertragen wird, empfangene Daten der Inhaltsdaten in einer Speichereinrichtung zu speichern und auch den Inhalt auf der Grundlage der gespeicherten Daten wiederzugeben; und

eine Code-Raten-Bestimmungseinrichtung (131) zum Bestimmen der Code-Rate basierend auf einer verbleibenden Zeit vor der Wiedergabe-Startzeit, die für die Empfangseinrichtung (120) als Zeit zum Starten der Wiedergabe des Inhalts von einem gegenwärtigen Zeitpunkt an eingestellt ist, und basierend auf einer verfügbaren Wiedergabezeit, die eine Zeit ist, die für die Wiedergabe des Inhalts basierend auf den in der Speichereinrichtung gespeicherten Inhaltsdaten verfügbar ist,

wobei die Inhaltswiedergabeeinrichtung (121) so konfiguriert ist, dass sie Inhaltsdaten empfängt, die mit der bestimmten Coderate codiert sind, und die Wiedergabe des Inhalts zu der eingestellten Wiedergabestartzeit beginnt.

23. Empfangsvorrichtung (120) nach Anspruch 22, wobei die Code-Raten-Bestimmungseinrichtung (131) so konfiguriert ist, dass sie einen Wert bestimmt, der kleiner wird, wenn die verfügbare Reproduktionszeit kürzer wird als eine verfügbare Soll-Reproduktionszeit, die ein Zielwert der verfügbaren Reproduktionszeit ist, und kleiner wird, wenn die verbleibende Zeit kürzer wird, wenn die Coderate.

24. Empfangsvorrichtung (120) nach Anspruch 23, wobei die Code-Raten-Bestimmungseinrichtung (131) konfiguriert ist, um eine Kommunikationsgeschwindigkeit zu erfassen, die eine Datenmenge der von der Sendevorrichtung (110) an die Empfangsvorrichtung (120) übertragenen Inhaltsdaten pro Zeiteinheit ist, und einen Wert eines Ergebnisses der Division eines Wertes eines Ergebnisses der Multiplikation der erfassten Kommunikationsgeschwindigkeit und der verbleibenden Zeit durch einen Wert eines Ergebnisses der Subtraktion der verfügbaren Reproduktionszeit von der verfügbaren Zielwiedergabezeit als Coderate zu bestimmen.

25. Empfangsvorrichtung (120) nach einem der Ansprüche 22 bis 24, wobei die Code-Raten-Bestimmungseinrichtung (131) konfiguriert ist, um die Codegerate mit jeder im Voraus eingestellten Änderungsperiode zu bestimmen.

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26. Programm mit Anweisungen, um eine Empfangsvorrichtung (120) gemäß einem der Ansprüche 22 bis 25 zu veranlassen, dass sie mit einer Sendevorrichtung (110) gemäß einem der Ansprüche 16 bis 20 kommunizieren kann.

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Europäisches Patentamt
European Patent Office
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Letter accompanying subsequently filed items

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	10828052.0
Applicant's or representative's reference	NBA 038 WO/EP

	Description of document	Original file name	Assigned file name
1	Reply to the communication under rule 71(3) EPC	Complete response to 71(3) - for filing.PDF	IGRA-1.pdf

	Fees	Factor applied	Fee schedule	Amount to be paid
15-1	007 Fee for grant, including fee for publication of the European patent specification (R71(3))	1	925.00	925.00
	Total:		**EUR**	**925.00**

	Payment	
1	Method of payment	Debit from deposit account
	Currency:	EUR
	The European Patent Office is hereby authorised, to debit from the deposit account with the EPO any fees and costs indicated on the fees page.	
	Deposit account number:	28000531
	Account holder:	BETTEN & RESCH Patent- und Rechtsanwälte PartGmbB
2	Refund/Reimburserment	
	Reimbursement (if any) to be made to EPO deposit account:	28000531
	Account holder:	BETTEN & RESCH Patent- und Rechtsanwälte PartGmbB

Signatures

Place:	**Munich**
Date:	**12 July 2018**
Signed by:	**Verena Sander 55699**
Association:	**BETTEN & RESCH Patent- und Rechtsanwälte PartGmbB**

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Annex to EPO Form 2004, Communication pursuant to Rule 71(3) EPC

Bibliographical data of European patent application No. 10 828 052.0

For the intended grant of the European patent, the bibliographical data are set out below, for information:

Title of invention:	- VERTEILUNGSSYSTEM - DISTRIBUTION SYSTEM - SYSTÈME DE DISTRIBUTION
Classification:	INV. H04N21/234 H04N21/262 H04N21/433 H04N21/6379
Date of filing:	13.10.2010
Priority claimed:	JP / 05.11.2009 / JPA2009253581
Contracting States* for which fees have been paid:	AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Extension States* for which fees have been paid:	
Validation States* for which fees have been paid:	
Applicant(s):**	NEC Corporation 7-1, Shiba 5-chome Minato-ku Tokyo 108-8001 JP
Inventor(s):	ONISHI, Takeo c/o NEC Corporation 7-1 Shiba 5-chome Minato-ku Tokyo 108-8001 JP

*)	If the time limit for the payment of designation fees according to Rule 39(1) EPC has not yet expired and the applicant has not withdrawn any designation, **all Contracting States/Extension States/Validation States** are currently still deemed to be designated. See also Rule 71a(3) EPC and, if applicable, the above Note to users of the automatic debiting procedure.
**)	If two or more applicants have designated different Contracting States, this is indicated here.

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Application No.	Ref.	Date
10 828 052.0 - 1209	NBA 038 WO/EP	02.03.2018
Applicant NEC Corporation		

Communication under Rule 71(3) EPC

1. Intention to grant

You are informed that the examining division intends to grant a European patent on the basis of the above application, with the text and drawings and the related bibliographic data as indicated below.

A copy of the relevant documents is enclosed.

1.1 In the text for the Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

Description, Pages

1-3, 5-58	filed with entry into the regional phase before the EPO	
4, 4a	filed in electronic form on	24-11-2015

Claims, Numbers

1-26	filed in electronic form on	25-02-2016

Drawings, Sheets

1/14-14/14	filed with entry into the regional phase before the EPO

With the following amendments to the above-mentioned documents proposed by the division

Description, Pages	56, 57
Claims, Numbers	26

Comments

DESCRIPTION
Page 56: Deletion of irrelevant and/or superfluous information (Rule 48(1)(c) EPC, Guidelines F-II, 7.4)
Page 57: the conditions referred to in the Guidelines F-III, 8 (reference documents) do not seem to be fulfilled, see further T 2477/12, points 2, 17 and 24 and T 908/05, points II, IX, 2.4.1
CLAIMS
Page 7, Claim 26: Scope of claim unclear - clarified (Art. 84 EPC)

1.2 Bibliographic data

The title of the invention in the three official languages of the European Patent Office, the international patent classification, the designated contracting states, the registered name(s) of the applicant(s) and the other bibliographic data are shown on **EPO Form 2056** (enclosed).

2. Invitation

You are invited, **within a non-extendable period of four months** of notification of this communication,

2.1 to EITHER approve the text communicated above and verify the bibliographic data (Rule 71(5) EPC)

(1) by filing a translation of the claim(s) in the other two official languages of the EPO

	Fee code	EUR
(2a) by paying the fee for grant including the fee for publication:	**007**	925.00
minus any amount already paid (Rule 71a(5) EPC):		0.00
Total amount:		925.00
(3) by paying additional claims fees under Rule 71(4) EPC; number of claims fees payable: 0	**016**	0.00
minus any amount already paid (Rule 71a(5) EPC):		0.00
Total amount:		0.00

Important: If the translations of the claims and fees have already been filed and paid respectively in reply to a previous communication under Rule 71(3) EPC, e.g. in the case of resumption of examination after approval (see Guidelines C-V, 6), **agreement as to the text to be granted** (Rule 71a(1) EPC) must be expressed within the same time limit (e.g. by approving the text and verifying the bibliographic data, by confirming that grant proceedings can go ahead with the documents on file and/or by stating which translations of the claims already on file are to be used).

Note 1: See "Notes concerning fee payments" below.
Note 2: Any overpaid "minus" amounts will be refunded when the decision to grant (EPO Form 2006A) has been issued.
Note 3: For the calculation of the grant fee under Article 2(2), No. 7, RFees (old fee structure), the number of pages is determined on the basis of a clean copy of the application documents, in which text deleted as a result of any amendments by the examining division is not shown. Such clean copy is made available via on-line file inspection only.

2.2 OR, in the case of disapproval, to request reasoned amendments or corrections to the text communicated above or keep to the latest text submitted by you (Rule 71(6) EPC).

In this case the translations of the claims and fee payments mentioned under point 2.1 above are NOT due.

The terms "amendment(s)" and "correction(s)" refer only to amendments or corrections of the application documents and not of other documents (e.g. bibliographic data, the designation of the inventor, etc.).

If filing amendments, you must identify them and indicate the basis for them in the application as filed. Failure to meet either requirement may lead to a communication from the examining division requesting that you correct this deficiency (Rule 137(4) EPC).

2.3 Bibliographic data

Where you request a change or correction of bibliographic data in response to the Rule 71(3) communication, this will **not** cause the sending of a further communication under Rule 71(3) EPC. You will still have to pay the fees and file translations in reply to the Rule 71(3) communication in the case of 2.1 above, unless you also file a reasoned request for amendments or corrections in response to the Rule 71(3) communication (see case 2.2 above).

3. Loss of rights

If neither of the two possible actions above (see points 2.1 or 2.2) is performed in due time, the European patent application will be deemed to be withdrawn (Rule 71(7) EPC).

4. Further procedure

4.1 In the case of point 2.1 above

4.1.1 The decision to grant the European patent will be issued, and the **mention of the grant** of the patent will be published in the European Patent Bulletin, if the requirements concerning the translation of the claims and the payment of all fees are fulfilled and there is agreement as to the text to be granted (Rule 71a(1) EPC).

Note on payment of the renewal fee:
If a renewal fee becomes due before the next possible date for publication of the mention of the grant of the European patent, publication will be effected only after the renewal fee and any additional fee have been paid (Rule 71a(4) EPC).

Under Article 86(2) EPC, the obligation to pay renewal fees to the European Patent Office terminates with the payment of the renewal fee due in respect of the year in which the mention of the grant of the European patent is published.

Note on payment of the designation fee(s):
If the designation fee(s) become(s) due after the communication under Rule 71(3) EPC, the mention of the grant of the European patent will not be published until these fees have been paid (Rule 71a(3) EPC).

4.1.2 After publication, the **European patent specification** can be downloaded free of charge from the EPO publication server https://data.epo.org/publication-server.

4.1.3 Filing of translations in the contracting states

As regards translation requirements prescribed by the contracting states under Article 65(1) EPC, please consult the website of the European Patent Office
www.epo.org ➞Law & practice ➞Legal texts, National law relating to the EPC
www.epo.org ➞Law & practice ➞All Legal texts ➞London Agreement

In the case of a valid extension or validation

As regards translation requirements prescribed by the extension or validation states, please consult the website of the European Patent Office
www.epo.org ➞Law & practice ➞Legal texts, National law relating to the EPC

Failure to supply a prescribed translation in a contracting state, or in an extension or validation state may result in the patent being deemed to be void *ab initio* in the state concerned (Art. 65(3) EPC).

4.2 In the case of 2.2 above

If the present communication under Rule 71(3) EPC is based on an auxiliary request and, within the time limit, you maintain the main request or a higher ranking request which is not allowable, the application will be refused (Art. 97(2) EPC).

If the examining division gives its consent to the requested amendments or corrections, it will issue a new communication under Rule 71(3) EPC; otherwise, it shall resume the examination proceedings (Rule 71(6) EPC).

5. Filing of a divisional application

Any divisional application relating to this European patent application must be filed directly with the European Patent Office in Munich, The Hague or Berlin and will be in the language of the proceedings for the present application, or if the latter was not in an official language of the EPO, the divisional application may be filed in the language of the present application as filed (see Article 76(1) and Rule 36(2) EPC). Any such divisional application must be filed while the present application is still pending (Rule 36(1) EPC; Guidelines A-IV, 1.1.1).

6. Notes concerning fee payments

6.1 Making payments

For payments made via deposit account, please note that as from 1 December 2017 debit orders will only be carried out if filed in an electronically processable format (xml), using an accepted means of filing as laid down in the Arrangements for deposit accounts (ADA), published in the Supplementary publication in the Official Journal.

All relevant information related to the modes of payment of fees to the EPO can be retrieved from the EPO website at "**Making Payments**".

6.2 Information concerning fee amounts

Procedural fees are usually adjusted every two years, on even years, with effect from 1 April. Therefore, before making a payment, parties should verify the amounts actually due on the date of payment using the applicable version of the Schedule of fees and expenses, published as a Supplement to the Official Journal of the EPO, available on the EPO website (**www.epo.org**) at **www.epo.org/schedule-of-fees**. The "Schedule of fees" table allows the viewing, downloading and searching of individual fee amounts, both current and previous.

6.3 Note to users of the automatic debiting procedure

The fee for grant, including the fee for publication, and any additional claims fees due under Rule 71(4) EPC will be debited automatically on the date of filing of the translations of the claims, or on the last day of the period of this communication. However, if the designation fee(s) become(s) due as set out in Rule 71a(3) EPC and/or a renewal fee becomes due as set out in Rule 71a(4) EPC, these should be paid separately by another permitted way of payment in order not to delay the publication of the mention of the grant. The same applies in these circumstances to the payment of extension and validation fees. The same applies in these circumstances to the payment of extension and validation fees.

Note: If a waiver is expressed in response to a Rule 71(3) communication (see OJ EPO 2015, A52), the fee for grant, including the fee for publication/printing, and any additional claims fees will not be debited automatically. These fees must be paid separately by another means of payment allowed under the Rules relating to Fees.

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Application No.: 10 828 052.0

IV.2. Patent classification

The classification has been changed. It now is as follows:

INV. H04N21/234 H04N21/262 H04N21/433 H04N21/6379

IV.3. Title of the invention

The title indicated on the published patent application remains unchanged. It reads as follows:

VERTEILUNGSSYSTEM

DISTRIBUTION SYSTEM

SYSTÈME DE DISTRIBUTION

IV.4. Documentation

21-2-2017
Date

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1st examiner

Hampson, Frances
2nd examiner

Enclosure(s):

DESCRIPTION

TITLE: DISTRIBUTION SYSTEM

TECHNICAL FIELD

[0001]

The present invention relates to a distribution system that transmits content data representing content from a transmission device to a reception device.

BACKGROUND ART

[0002]

There is a known distribution system that includes a transmission device and a plurality of reception devices configured to be capable of communicating with each other and allows the plurality of reception devices to synchronously reproduce content. As one of this type of distribution systems, a distribution system described in Patent Document 1 matches time of a clock disposed to each of the plurality of reception devices with time of a reference clock. Moreover, the transmission device transmits reproduction start time, which is time that the reception device starts reproduction of content, to each reception terminal.

[0003]

Then, the transmission device transmits content data representing content (video, audio, etc.) to each of the reception devices. Each of the reception devices stores received data among the content data into a storage device (a buffer) while receiving the content data. Moreover, each

of the reception devices starts reproduction of content based on the stored data at the reproduction start time. As a result, it is possible to match the positions to reproduce the content with each other among the plurality of reception devices.

[0004]

Further, a distribution system described in Patent Document 2 is a system that allows a plurality of reception devices to synchronously reproduce content even if time to start reproduction of the content varies depending on the reception device. In this distribution system, while a first reception device is reproducing content, a second reception device estimates a time required to start reproduction of the content and determines reproduction start time based on the estimated time. Then, the second reception device transmits the determined reproduction start time to the transmission device.

[0005]

Consequently, the transmission device transmits, to the second reception device, content data to be transmitted to the first reception device at and after the reproduction start time. Then, the second reception device starts reproduction of content based on the stored data at the reproduction start time. As a result, it is possible to match positions to reproduce content with each other between the first reception device and the second reception device.

[0006]

[Patent Document 1] Japanese Unexamined Patent Application Publication No. 2005-191786

[Patent Document 2] Japanese Unexamined Patent Application Publication No. 2007-13705

[0007]

While the reception device is receiving content data, the amount of data that the reception device receives from the transmission device per unit time (i.e., a communication speed) varies depending on the status of use of a communication line, and so on. Therefore, when the communication speed becomes extremely low, there is a case that the data amount of content data stored in the storage device of the reception device does not reach a sufficient amount by the reproduction start time. In such a case, there is a fear that the reception device cannot start reproduction of content at the reproduction start time.

[0008]

In order to deal with this, it can be considered to configure a distribution system to change a code rate of content data to be transmitted based on an available reproduction time, which is a time that it is possible to reproduce content based on content data stored in the storage device of the reception device.

[0009]

However, during a period between start of reception of content data by the reception device and reproduction start time, the available reproduction time gradually increases from 0. Therefore, in a case that the code rate is determined based on only the available reproduction time, there is a fear that the code rate is set to be extremely small immediately after the reception device starts reception of the content data and, on the other hand, the code rate is set to be extremely high immediately before the reproduction start time.

[0010]

Further, such a problem arises not only in a distribution system in which a plurality of

reception devices synchronously reproduce content but also in a distribution system in which one reception device starts reproduction of content at set reproduction start time.

< insert description page 4a here >

SUMMARY

[0011]

Accordingly, an object of the present invention is to provide a distribution system capable of solving the abovementioned problems, "the code rate may be set to be extremely high" and "the reception device may be unable to start reproduce content at set reproduction start time."

[0012]

In order to achieve the object, a distribution system of an exemplary embodiment of the present invention is a system including a transmission device and a reception device configured to be capable of communicating with each other.

The transmission device is equipped with a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device.

The reception device is equipped with a content reproducing means for, while receiving the content data transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data.

The distribution system comprises a code rate determining means for determining the code rate based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an

US 7 606 928 B2 relates to a method for providing to a sender of RTP packets the actual receiver buffer fullness level in a receiver of the RTP packets at a certain time instant represented as remaining playout duration in time. The receiver sends in an RTCP report the sequence number of a selected RTP packet in the receiver buffer and the time difference between the scheduled playout time of this packet and the current time. Based on this timing information, the sender calculates the amount of time it would take for the receiver buffer to empty if the receiver continues to playout at normal speed and no further RTP packets arrive to the receiver buffer. This receiver buffer fullness level information can be used at the sender to adjust the transmission rate and/or nominal playout rate of the RTP packets in order to maintain a targeted receiver buffer fullness level.

US 2007/133405 A1 relates to a congestion controller for a media server, which monitors both the buffer status of the client device as well as the network performance. The congestion controller may increase or decrease the pacing of packets transmitted over the network based on the fullness of a buffer on the client device, but may also change the bit rate of the packets based on the network performance. By monitoring both the client device status and network performance, the pacing and bit rate of the packets may be varied together to achieve an optimized throughput and maximized user experience of the media.

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available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

The content transmitting means is configured to change the code rate of the content data to be transmitted to the reception device to the determined code rate.

The content reproducing means is configured to start reproduction of the content at the set reproduction start time.

[0013]

Further, a distribution method of another exemplary embodiment of the present invention is a method that is applied to a distribution system including a transmission device and a reception device configured to be capable of communicating with each other and that comprises:

transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device, by the transmission device;

while receiving the content data transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data, by the reception device;

determining the code rate based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device;

changing the code rate of the content data to be transmitted to the reception device to

the determined code rate, by the transmission device; and

starting reproduction of the content at the set reproduction start time, by the reception device.

[0014]

Further, a transmission device of another exemplary embodiment of the present invention is a device configured to be capable of communicating with a reception device.

The transmission device comprises a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device.

The content transmitting means is configured to change the code rate of the content data to be transmitted to the reception device to a code rate determined based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

[0015]

Further, a program of another exemplary embodiment of the present invention comprises instructions for causing a transmission device configured to be capable of communicating with a reception device to realize a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device.

The content transmitting means is configured to change the code rate of the content data

to be transmitted to the reception device to a code rate determined based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

[0016]

Further, a reception device of another exemplary embodiment of the present invention is a device configured to be capable of communicating with a transmission device.

The reception device comprises:

a content reproducing means for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means for determining the code rate based on a remaining time before reproduction start time set as time to start reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device.

The content reproducing means is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

[0017]

Further, a program of another exemplary embodiment of the present invention comprises instructions for causing a reception device configured to be capable of communicating

with a transmission device to realize:

a content reproducing means for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means for determining the code rate based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

The content reproducing means is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

[0018]

With the configurations described above, the present invention enables a reception device to securely start reproduction of content at set reproduction start time while avoiding meaninglessly lowering a code rate.

BRIEF DESCRIPTION OF DRAWINGS

[0019]

Fig. 1 is a diagram showing a schematic configuration of a distribution system according to a first exemplary embodiment of the present invention;

Fig. 2 is a block diagram schematically showing a function of the distribution system

according to the first exemplary embodiment of the present invention;

Fig. 3 is a sequence diagram showing an operation of the distribution system according to the first exemplary embodiment of the present invention;

Fig. 4 is a flowchart showing a transmission control program executed by a server device according to the first exemplary embodiment of the present invention;

Fig. 5 is a table showing session information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 6 is a flowchart showing a reproduction start control program executed by a terminal device according to the first exemplary embodiment of the present invention;

Fig. 7 is a table showing session information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 8 is a table showing session information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 9 is a table showing history information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 10 is a flowchart showing a code rate change control program executed by the server device according to the first exemplary embodiment of the present invention;

Fig. 11 is a table showing history information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 12 is a table showing history information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 13 is a sequence diagram showing an operation of the distribution system according

to the first exemplary embodiment of the present invention;

Fig. 14 is a table showing session information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 15 is a table showing session information stored by the server device according to the first exemplary embodiment of the present invention; and

Fig. 16 is a block diagram schematically showing a function of a distribution system according to a second exemplary embodiment of the present invention.

EXEMPLARY EMBODIMENTS

[0020]

Below, exemplary embodiments of a distribution system, a distribution method, a transmission device, a program and a reception device according to the present invention will be described with reference to Figs. 1 to 16.

[0021]

<First Exemplary Embodiment>

As shown in Fig. 1, a distribution system 1 according to the first exemplary embodiment includes a server device (a transmission device) 10 and a plurality of (in this exemplary embodiment, three) terminal devices (reception devices) 20a, 20b and 20c. The server device 10 and the terminal devices 20a to 20c are connected so as to be capable of communicating with each other via a communication line (in this exemplary embodiment, the Internet) NW.

[0022]

The server device 10 is an information processing device. The server device 10 is

equipped with a central processing unit (CPU) and a storage device (a memory and a hard disk drive (HDD)), which are not shown in the drawings. The server device 10 is configured to realize a function described later by execution of a program stored in the storage device by the CPU.

[0023]

In this exemplary embodiment, the respective terminal devices 20a to 20c are personal computers. The respective terminal devices 20a to 20c may be mobile phone terminals, personal handyphone systems (PHS), personal data assistances (personal digital assistants; PDA), car navigation terminals, game terminals, or the like.

[0024]

The terminal devices 20a to 20c are each equipped with a CPU, a storage device, an input device and an output device. The output device has a display. The output device causes the display to display an image composed of letters, figures and so on based on image information outputted by the CPU. The input device has a keyboard and a mouse. The terminal devices 20a to 20c are each configured so that information based on an operation by a user is inputted via the keyboard and the mouse.

[0025]

The terminal devices 20a to 20c are each configured to realize a function described later by execution of a program stored in the storage device by the CPU.

[0026]

Fig. 2 is a block diagram showing a function of the distribution system 1 configured as described above. Herein, a function of the terminal device 20a among the terminal devices 20a to 20c will be described. The terminal devices 20b and 20c each have the same function as the

terminal device 20a.

[0027]

Further, a function of the distribution system 1 is realized by execution of a program presented with a flowchart shown in Fig. 6 described later, and so on, by the CPU of the terminal device 20a, and by execution of programs presented with flowcharts shown in Figs. 4 and 10, and so on, by the CPU of the server device 10.

[0028]

A function of the terminal device 20a includes a request transmission part 31, a synchronous reproduction controlling part (a synchronous reproduction controlling means) 32, a content reproducing part (a content reproducing means) 33, and an available reproduction time transmission part 34.

[0029]

Further, a function of the server device 10 includes a request reception part 41, a session information storage part 42, a reproduction start time setting part (a reproduction start time setting means) 43, a content data storage part 44, a content transmitting part (a content transmitting means) 45, an available reproduction time reception part 46, and a code rate determining part (a code rate determining means) 47.

[0030]

The request transmission part 31 of the terminal device 20a accepts a session start instruction inputted by the user via the input device. The session start instruction is information of an instruction to start a session. The session start instruction includes content identification information (content ID) for identifying content and other terminal ID, which is terminal

identification information (terminal ID) for identifying another terminal device that synchronously reproduces content.

[0031]

Upon acceptance of the session start instruction, the request transmission part 31 transmits, to the server device 10, a session start request including: the content ID included in the session start instruction; and terminal ID composed of own terminal ID, which is terminal identification information (terminal ID) for identifying an own device (the terminal device 20a), and the other terminal ID included in the session start instruction. The session start request is information of a request to start a session.

[0032]

The request reception part 41 of the server device 10 receives the session start request from the terminal device 20a. Upon reception of the session start request, the request reception part 41 generates session identification information (session ID) for identifying a session. Moreover, the request reception part 41 stores, into the session information storage part 42, session information including: the generated session ID; and the content ID and the terminal ID that are included in the session start request.

[0033]

In addition, the request reception part 41 transmits the generated session ID to each of the terminal devices 20a to 20c identified by the terminal ID included in the session start request.

[0034]

The request transmission part 31 of the terminal device 20a receives the session ID from the server device 10. Moreover, the request transmission part 31 accepts a session participation

instruction inputted by the user via the input device. The session participation instruction is information of an instruction to participate in a session.

[0035]

Upon acceptance of the session participation instruction, the request transmission part 31 transmits, to the server device 10, a session participation request including; the received session ID; the terminal identification information (the terminal ID) for identifying the own device (the terminal device 20a), i.e., the own terminal ID; an activation time; and a communication speed. The session participation request is information of a request to participate in a session.

[0036]

The activation time is a time required to activate an application program that the terminal device 20a executes for reproducing content. Moreover, the communication speed is the data amount of data transmitted from the server device 10 to the terminal device 20a per unit time. In this exemplary embodiment, the activation time and the communication speed are values inputted by the user. The terminal device 20a may be configured to measure the activation time and the communication speed and transmit a session participation request including the measured activation time and communication speed.

[0037]

The request reception part 41 of the server device 10 receives the session participation request from each of the terminal devices 20a to 20c. Upon reception of the session participation request, the request reception part 41 adds the activation time and communication speed included in the session participation request to the session information including the session ID and

terminal ID included in the session participation request, among the session information stored in the session information storage part 42.

[0038]

The content data storage part 44 of the server device 10 stores (accumulates) a plurality of content data in advance. Each of the content data is data representing one of a plurality of contents (e.g., information representing video and/or audio). The content data storage part 44 stores, as the content data representing the respective contents, a plurality of content data in each of which the content is coded with a code rate varying with the content. The code rate represents the data amount (the data size, e.g., the number of bytes) of content data for reproducing content at constant speed (reproducing content at 1x speed) for a unit time (e.g., one second).

[0039]

The reproduction start time setting part 43 of the server device 10 includes a reproduction start time determination part 43a and a reproduction start time transmission part 43b.

[0040]

The reproduction start time determination part 43a determines reproduction start time based on a session participation request received before a lapse of a preset standby time after reception of a session start request. The reproduction start time is time that a terminal device having transmitted the session participation request starts reproduction of content.

[0041]

To be specific, at a moment that the standby time elapses after reception of the session start request, the reproduction start time determination part 43a acquires session information

including session ID generated in response to the session start request, among the session information stored in the session information storage part 42.

[0042]

The reproduction start time determination part 43a calculates an each-device reproduction preparation time T_p for each of the acquired session information (i.e., each of the terminal devices). The each-device reproduction preparation time T_p is a time required for the terminal device to start reproduction of content.

[0043]

In this exemplary embodiment, the reproduction start time determination part 43a extracts content data representing content identified by content ID included in the acquired session information, from among the content data stored in the content storage part 44. Then, the reproduction start time determination part 43a specifies a code rate r having a value that is equal to or less than a communication speed included in the acquired session information and is the closest to the communication speed, from among the code rates of the extracted content data.

[0044]

Then, the reproduction start time determination part 43a calculates a reproduction preparation communication time T_c based on the specified code rate r, a communication speed B included in the acquired session, a preset target available reproduction time T_d, and an equation (1) shown below.

$$T_c = r \cdot T_d / B \qquad (1)$$

[0045]

The target available reproduction time T_d is a target value of an available reproduction

time. The target available reproduction time may be set for each terminal device. Alternatively, the target available reproduction time may be a value received from a terminal device. The available reproduction time is a time that a terminal device can reproduce content based on content data stored in the storage device (a buffer part 33 described later) of the terminal device. The reproduction preparation communication time T_c is a time required for the available reproduction time to coincide with the target available reproduction time T_d after the terminal device starts reception of the content data.

[0046]

Furthermore, the reproduction start time determination part 43a adds an activation time T_a included in the acquired session information and the calculated reproduction preparation communication time T_c, thereby calculating the each-device reproduction preparation time T_p as shown by an equation (2) below.

$$T_p = T_a + T_c \qquad (2)$$

[0047]

In addition, the reproduction start time determination part 43a adds a maximum value T_{pmax} of the calculated each-device reproduction preparation time T_p with present time t, thereby determining reproduction start time T_s as shown by an equation (3) below.

$$T_s = t + T_{pmax} \qquad (3)$$

[0048]

In a case that a session participation request is received after a lapse of the standby time from reception of a session start request, the reproduction start time determination part 43a determines reproduction start time T_s for a terminal device having transmitted the session

participation request in the same manner as described above.

[0049]

Upon determination of the reproduction start time, the reproduction start time determination part 43a adds the determined reproduction start time to the session information including the session ID and terminal ID included in the session participation request that is the basis of determination of the reproduction start time.

[0050]

The reproduction start time transmission part 43b transmits the reproduction start time determined by the reproduction start time determination part 43a to each terminal device having transmitted the session participation request.

Thus, the reproduction start time setting part 43 sets reproduction start time based on a target available reproduction time, an activation time, and a communication speed.

[0051]

The synchronous reproduction controlling part 32 of the terminal device 20a includes a reproduction start time reception part 32a. The reproduction start time reception part 32a receives reproduction start time transmitted from the server device 10. The synchronous reproduction controlling part 32 stores the reproduction start time received by the reproduction start time reception part 32a into the storage device. The synchronous reproduction controlling part 32 determines whether present time has reached the stored reproduction start time (it becomes the reproduction start time at this moment) every time a preset control period elapses.

[0052]

When the present time reaches the stored reproduction start time, the synchronous

reproduction controlling part 32 outputs a reproduction start instruction to the content reproducing part 33. The reproduction start instruction is information of an instruction to start reproduction of content. Thus, the synchronous reproduction controlling part 32 matches positions to reproduce content to be reproduced by the respective terminal devices 20a to 20c with each other among the terminal devices 20a to 20c.

[0053]

The content transmitting part 45 of the server device 10 transmits the content data stored in the content data storage part 44 to the terminal devices 20a to 20c. That is to say, the content transmitting part 45 transmits the content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the terminal devices 20a to 20c.

[0054]

To be specific, when the reproduction start time is determined by the reproduction start time setting part 43, the content transmitting part 45 transmits the content data stored in the content data storage part 44 to the terminal device having transmitted the session participation request that is the basis of determination of the reproduction start time.

[0055]

At this moment, the content transmitting part 45 transmits content data that is identified by the content ID included in the session information including the session ID included in the session participation request and is coded with a code rate specified by the reproduction start time determination part 43a for the terminal device having transmitted the session participation request.

[0056]

In the case of transmitting the content data based on the session participation request received before the standby time elapses after reception of the session start request, the content transmitting part 45 starts transmission of the content data with the head position.

[0057]

On the other hand, in the case of transmitting the content data based on the session participation request received after a lapse of the standby time from reception of the session start request, the content transmitting part 45 determines whether a determination condition is satisfied or not. Herein, the determination condition is a condition that reproduction start time determined by the reproduction start time setting part 43 based on the session participation request (second reproduction start time) is later time than reproduction start time determined by the reproduction start time setting part 43 based on another session participation request including the same session ID as the session participation request (first reproduction start time).

[0058]

In a case that the second reproduction start time is time before the first reproduction start time, the content transmitting part 45 starts transmission of the content data from the head position.

[0059]

On the other hand, in a case that the second reproduction start time is time after the first reproduction start time, the content transmitting part 45 determines a position behind the head position by a difference between the first reproduction start time and the second reproduction start time, as a transmission start position. The transmission start position is in content data, which is a position to start transmission of the content data. Then, the content transmitting part

45 starts transmission of the content data from the determined transmission start position.

[0060]

That is to say, in a case that reproduction start time set for a second terminal device (second reproduction start time) is later time than reproduction start time set for a first terminal device (first start reproduction start time), the content transmitting part 45 estimates a content reproduction position (i.e., a transmission start position) that the first terminal device is reproducing at the second reproduction start time. Then, the content transmitting part 45 transmits a portion of the content data after the estimated reproduction position, to the second terminal device.

[0061]

The content reproducing part 33 of the terminal device 20a includes a content reception part 33a, a buffer part 33b, and a content reproduction execution part 33c.

The content reception part 33a receives content data transmitted by the server device 10. The buffer part 33b stores data received by the content reception part 33a. The content reproduction execution part 33c reproduces content based on the data stored by the buffer part 33b.

[0062]

That is to say, the content reproducing part 33, while receiving content data transmitted by the server device 10, stores received data of the content data into the storage device and reproduces content based on the stored data (performs streaming reproduction).

[0063]

In the case of accepting a reproduction start instruction outputted by the synchronous

reproduction controlling part 32 (i.e., at set reproduction start time), the content reproduction execution part 33c starts reproduction of content.

[0064]

The available reproduction time transmission part 34 of the terminal device 20a acquires an available reproduction time, which is a time that the content reproduction execution part 33c can reproduce the content based on the content data stored by the buffer part 33b, every time an acquisition period (a change period) set in advance elapses. Upon acquisition of the available reproduction time, the available reproduction time transmission part 34 transmits available reproduction time information, which includes the acquired available reproduction time, the own terminal ID (the terminal ID) and the session ID, to the server device 10.

[0065]

The available reproduction time reception part 46 of the server device 10 receives available reproduction time information from the respective terminal devices 20a to 20c.

When the available reproduction time information is received by the available reproduction time reception part 46, the code rate determining part 47 of the server device 10 acquires the reproduction start time included in the session information including the terminal ID and session ID included in the available reproduction time information.

[0066]

The code rate determining part 47 determines a code rate for the terminal device having transmitted the available reproduction time information, based on a remaining time before the acquired (i.e., set) reproduction start time from the present moment and the available reproduction time included in the available reproduction time information.

[0067]

To be specific, the code rate determining part 47 determines, as the code rate, a value that becomes smaller as the available reproduction time becomes shorter than the target available reproduction time and that becomes smaller as the remaining time becomes shorter.

[0068]

In this exemplary embodiment, the code rate determining part 47 calculates (acquires) a communication speed B_n during a period between the present moment and a moment that is the change period before (past), based on an equation (4) shown below, wherein n denotes an integer and represents the number of times of reception of the available reproduction time information from the terminal device.

$$B_n = (T_n - T_{n-1}) \cdot r_n / (t_n - t_{n-1}) \quad (4)$$

[0069]

In the equation, t_n denotes time of reception of the available reproduction time information this time (i.e., time at the present moment), and t_{n-1} denotes time of reception of the available reproduction time information last time (i.e., time at a moment that is the change period before). Moreover, T_n denotes the available reproduction time received this time (i.e., at the present moment), and T_{n-1} denotes the available reproduction time received last time (i.e., at a moment that is the change period before). Moreover, r_n denotes a code rate of content data transmitted during a period between the time t_{n-1} to the time t_n.

[0070]

In this exemplary embodiment, assuming a communication speed is kept at the communication speed B_n during a period between the present moment and the reproduction start

time, the code rate determining part 47 determines a code rate r_{n+1} of content data to be transmitted by time of the available reproduction time information next time (i.e., time at a moment that is the change period after). That is to say, the code rate determining part 47 determines the code rate r_{n+1} based on an equation (5) shown below.

$$r_{n+1} = B_n \cdot (t_s - t_n) / (T_d - T_n) \quad (5)$$

[0071]

That is to say, the code rate determining part 47 determines, as the code rate r_{n+1}, a result of dividing a result of multiplying the acquired communication speed B_n and a remaining time t_s-t_n by a result T_d-T_n of subtracting the available reproduction time T_n from the target available reproduction time T_d.

[0072]

When the code rate r_{n+1} is determined by the code rate determining part 47, the content transmitting part 45 changes content data to be transmitted to the terminal device having transmitted the available reproduction time information having been the basis of determination of the code rate r_{n+1}, to content data coded with the code rate r_{n+1}. That is to say, the content transmitting part 45 changes the code rate of the content data to be transmitted to the terminal device having transmitted the available reproduction time information, to the code rate determined based on the available reproduction time information.

[0073]

In a case that content data of the code rate r_{n+1} determined by the code rate determining part 47 is not stored by the content data storage part 44, the content transmitting part 45 transmits content data having a code rate that is equal to or less than the code rate r_{n+1} and is the closest to

the code rate r_{n+1}, among the content data stored by the content storage part 44.

[0074]

Next, an operation of the abovementioned distribution system 1 will be described. In this exemplary embodiment, the server device 10 stores, for each content, content data respectively coded with 2Mbps, 4Mbps, 16Mbps and 50Mbps into the storage device in advance. Moreover, the target available reproduction time T_d is set to 30 seconds.

[0075]

As shown in Fig. 3, the terminal device 20a accepts a session start instruction including "C01" as content ID, and "R02" and "R03" as other terminal ID. In this exemplary embodiment, "R01" denotes terminal ID for identifying the terminal device 20a, "R02" denotes terminal ID for identifying the terminal device 20b, and "R03" denotes terminal ID for identifying the terminal device 20c.

[0076]

Upon acceptance of the session start instruction, the terminal device 20a transmits a session start request including "C01" as content ID, and "R01," "R02," and "R03" as other terminal ID to the server device 10 (step S101).

[0077]

Upon reception of the session start request from the terminal device 20a, the server device 10 executes a transmission control program shown by a flowchart in Fig. 4. The server device 10 generates "S01" as session ID for identifying a session. Moreover, the server device 10 stores session information including the generated session ID "S01" and the content ID "C01" and terminal ID ("R01", "R02," and "R03") included in the session start request, into the storage

device as shown in Fig. 5.

[0078]

In addition, the server 10 transmits the generated session ID to each of the terminal devices 20a to 20c identified by the terminal ID included in the session start request (step S102 of Fig. 4, step S102 of Fig. 3). After that, the server device 10 waists for the standby time (in this exemplary embodiment, three seconds) (step S202 of Fig. 4).

[0079]

Next, when the user of the terminal device 20a inputs a session participation instruction, the terminal device 20a executes a reproduction start control program shown by a flowchart in Fig. 6. The terminal device 20a transmits, to the server device 10, a session participation request including the received session ID "S01," the terminal ID "R01," an activation time "1200" (ms), and a communication speed "3" (Mbps) (step S301 of Fig. 6, step S103 of Fig. 3).

[0080]

In this exemplary embodiment, like the terminal device 20a, the terminal device 20b also transmits, to the server device 10, a session participation request including the session ID "S01," the terminal ID "R02," an activation time "1000," (ms) and a communication speed "50" (Mbps) (step S104 of Fig. 3).

[0081]

Upon reception of the session participation request from each of the terminal devices 20a and 20b, the server device 10 adds the activation time and communication speed included in the session participation request to the session information including the session ID and terminal ID included in the session participation request among the session information stored in the

storage device, as shown in Fig. 7.

[0082]

Then, after a lapse of the standby time, the server device 10 specifies, for each of the terminal devices 20a and 20b having transmitted the session participation requests, a code rate r that is equal to or less than the communication speed and is the closest to the communication speed, from among the code rates of the content data stored in the storage device. In this exemplary embodiment, the server device 10 specifies "2Mbps" as the code rate r for the terminal device 20a, and specifies "50Mbps" as the code rate r for the terminal device 20b.

[0083]

Next, for each of the terminal devices 20a and 20b having transmitted the session participation requests, the server device 10 calculates each-device reproduction preparation time T_p, based on the communication speed B and activation time T_a included in the stored session information and the preset target available reproduction time T_d (step S203 of Fig. 4).

[0084]

In this exemplary embodiment, the server device 10 acquires "21.2" as the each-device reproduction preparation time T_p for the terminal device 20a and acquires "31" as the each-device reproduction preparation time T_p for the terminal device 20b, based on the equations (1) to (3) shown above.

[0085]

Next, the server device 10 determines reproduction start time T_s ("13:01:34") based on a maximum value T_{pmax} (herein, "31") of the calculated each-device reproduction preparation times T_p (step S204 of Fig. 4). Then, the server device 10 adds the determined reproduction start

time to the session information including the session ID "S01" and the terminal ID "R01" and the session information including the session ID "S01" and the terminal ID "R02," respectively, as shown in Fig. 8.

[0086]

Next, the server device 10 transmits the determined reproduction start time T_s to each of the terminal devices 20a and 20b having transmitted the session participation requests (step S205 of Fig. 4, step S105 of Fig. 3).

[0087]

Thus, the terminal device 20a receives the reproduction start time T_s from the server device 10 (step S302 of Fig. 6). The terminal device 20b also operates like the terminal device 20a after that.

[0088]

Then, the server device 10 determines whether the determined reproduction start time T_s is time after reproduction start time determined based on another session participation request including the same session ID as the received session participation request (step S206 of Fig. 4).

[0089]

At this moment, the server device 10 has not received another session participation request including the same session ID as the received session participation request. Therefore, the server device 10 determines "No" and proceeds to step S208 to start transmission of content data to each of the terminal devices 20a and 20b having transmitted the session participation requests from the head position of the content data (step S208 of Fig. 4, step S106 of Fig. 3).

[0090]

At this moment, the content data that the server device 10 transmits to the terminal device 20a is content data representing content identified by the content ID "C01" included in the session information including the session ID "S01." Moreover, this content data is data coded with the code rate specified based on the communication speed included in the session participation request received from the terminal device 20a.

[0091]

Likewise, the content data that the server device 10 transmits to the terminal device 20b is content data representing content identified by the content ID "C01" included in the session information including the session ID "S01." Moreover, this content data is data coded with the code rate specified based on the communication speed included in the session participation request received from the terminal device 20b.

[0092]

Further, the server device 10 stores history information that associates the session ID and terminal ID included in the session participation request, "0" as the initial value of an available reproduction time, and a difference "31" between the reproduction start time and the present time into the storage device as shown in Fig. 9.

[0093]

On the other hand, the terminal device 20a starts reception of the content data transmitted by the server device 10 (step S303 of Fig. 6). Next, the terminal device 20a determines whether the present time has reached the reproduction start time T_s (step S304 of Fig. 6). At this moment, the present time has not reached the reproduction start time T_s.

[0094]

Therefore, the terminal device 20a determines "No" and proceeds to step S305 to determine whether a transmission period (in this exemplary embodiment, five seconds) has elapsed after start of reception of the content data (step S305 of Fig. 6). At this moment, the transmission period has not elapsed after start of reception of the content data.

[0095]

Therefore, the terminal device 20a determines "No" and returns to step S304 to repeatedly execute the abovementioned process until the transmission period elapses after start of reception of the content data.

[0096]

Then, after a lapse of the transmission period from start of reception of the content data, the terminal device 20a determines "Yes" at step S305 and proceeds to step S306 to acquire an available reproduction time. Herein, it is assumed that the acquired available reproduction time is "7" seconds.

[0097]

Then, the terminal device 20a transmits available reproduction time information including the acquired available reproduction time "7," the terminal ID "R01," and the session ID "S01" to the server device 10 (step S107 of Fig. 3). Likewise, the terminal device 20b transmits available reproduction time information including the acquired available reproduction time "2," the terminal ID "R02," and the session ID "S01" to the server device 10 (step S108 of Fig. 3).

[0098]

On the other hand, the server device 10 proceeds to step S209 of Fig. 4 and, in order to

perform a code rate change control on each of the terminal devices, executes a code rate change control program shown by a flowchart in Fig. 10 independently on each of the terminal devices 20a and 20b having been transmitting the content data.

[0099]

First, a code rate change control that the server device 10 executes on the terminal device 20a will be described.

[0100]

The server device 10 determines whether the present time has reached the reproduction start time T_s (step S401 of Fig. 10). At this moment, the present time has not reached the reproduction start time T_s.

[0101]

Therefore, the server device 10 determines "No" and proceeds to step S402 to determine whether the server device 10 has received available reproduction time information from the terminal device 20a. In a case that the server device 10 has not received available reproduction time information from the terminal device 20a, the server device 10 returns to step S401 to repeatedly execute the abovementioned process.

[0102]

The server device 10 is receiving available reproduction time information from the terminal device 20a now. Therefore, the server device 10 determines "Yes" and proceeds to step S403 to, as shown in Fig. 11, store history information that associates the session ID "S01," terminal ID "R01" and available reproduction time "7" included in the available reproduction time information with a difference "26" between the reproduction start time and the present time,

into the storage device.

[0103]

The server device 10 determines a code rate based on the history information stored in the storage device. In this exemplary embodiment, the server device 10 acquires "2.8 Mbps" as the communication speed B_n based on the equation (4) shown above. Moreover, the server device 10 acquires (determines) "3.165 Mbps" as the code rate r_{n+1} based on the equation (5) shown above (step S403 of Fig. 10).

[0104]

Then, the server device 10 specifies "2 Mbps" as a code rate that is equal to or less than the code rate r_{n+1} and is the closest to the code rate r_{n+1} from among the code rates of the content data stored in the storage device. Next, the server device 10 changes the code rate of the content data being transmitted to the terminal device 20a, to the specified code rate "2 Mbps" (step S404 of Fig. 10). After that, the server device 10 returns to step S401 to repeatedly execute the process described above.

[0105]

Next, a code rate change control that the server device 10 executes on the terminal device 20b will be described.

[0106]

Upon reception of available reproduction time information from the terminal device 20b, the server device 10 proceeds to step S403 of Fig. 10 and, as shown in Fig. 11, stores history information that associates the session ID "S01," terminal ID "R02" and available reproduction time "2" included in the available reproduction time information with a difference "26" between

the reproduction start time and the present time, into the storage device.

[0107]

The server device 10 determines a code rate based on the history information stored in the storage device. In this exemplary embodiment, the server device 10 acquires "20 Mbps" as the communication speed B_n based on the equation (4) shown above. Moreover, the server device 10 acquires (determines) "18.57 Mbps" as the code rate r_{n+1} based on the equation (5) described above (step S403 of Fig. 10).

[0108]

Then, the server device 10 specifies "16 Mbps" as a code rate that is equal to or less than the code rate r_{n+1} and is the closest to the code rate r_{n+1} from among the code rates of the content data stored in the storage device. Next, the server device 10 changes the code rate of the content data being transmitted to the terminal device 20b, to the specified code rate "16 Mbps" (step S404 of Fig. 10). After that, the server device 10 returns to step S401 to repeatedly execute the process described above.

[0109]

Then, when the transmission period elapses again after transmission of the available reproduction time information by the terminal device 20a and the terminal device 20b, the terminal device 20a and the terminal device 20b respectively determine "Yes" at step S305 of Fig. 6 and proceed to step S306 to transmit available reproduction time information to the server device 10.

[0110]

It is assumed that the terminal device 20a transmits available reproduction time

information including an available reproduction time "18," terminal ID "R01" and session ID "S01" to the server device 10 and the terminal device 20b transmits available reproduction time information including an available reproduction time "14," terminal ID "R02" and session ID "S01" to the server device 10.

[0111]

First, a code rate change control that the server device 10 executes on the terminal device 20a will be described.

[0112]

The server device 10 determines "Yes" at step S402 of Fig. 10 and proceeds to step S403 to, as shown in Fig. 12, store history information that associates the session ID "S01," terminal ID "R01" and available reproduction time "18" included in the available reproduction time information with a difference "21" between the reproduction start time and the present time, into the storage device.

[0113]

The server device 10 determines a code rate based on the history information stored in the storage device. In this exemplary embodiment, the server device 10 acquires "4.4 Mbps" as the communication speed B_n based on the equation (4) shown above. Moreover, the server device 10 acquires (determines) "7.7 Mbps" as the code rate r_{n+1} based on the equation (5) shown above (step S403 of Fig. 10).

[0114]

Then, the server device 10 specifies "4 Mbps" as a code rate that is equal to or less than the code rate r_{n+1} and is the closest to the code rate r_{n+1} from among the code rates of the content

data stored in the storage device. Next, the server device 10 changes the code rate of the content data being transmitted to the terminal device 20a, to the specified code rate "4 Mbps" (step S404 of Fig. 10). After that, the server device 10 returns to step S401 to repeatedly execute the process described above.

[0115]

Next, a code rate change control that the server device 10 executes on the terminal device 20b will be described.

[0116]

The server device 10 determines "Yes" at step S402 of Fig. 10 and proceeds to step S403 to, as shown in Fig. 12, store history information that associates the session ID "S01," terminal ID "R02" and available reproduction time "14" included in the available reproduction time information with a difference "21" between reproduction start time and present time into the storage device.

[0117]

The server device 10 determines a code rate based on the history information stored in the storage device. In this exemplary embodiment, the server device 10 acquires "38.4 Mbps" as the communication speed B_n based on the equation (4) shown above. Moreover, the server device 10 acquires (determines) "50.4 Mbps" as the code rate r_{n+1} based on the equation (5) shown above (step S403 of Fig. 10).

[0118]

Then, the server device 10 specifies "50 Mbps" as a code rate that is equal to or less than the code rate r_{n+1} and is the closest to the code rate r_{n+1} from among the code rates of the

content data stored in the storage device. Next, the server device 10 changes the code rate of the content data being transmitted to the terminal device 20a, to the specified code rate "50 Mbps" (step S404 of Fig. 10). After that, the server device 10 returns to step S401 to repeatedly execute the abovementioned process.

[0119]

After that, every time the transmission period (the change period) elapses, the server device 10 determines a code rate for each of the terminal devices 20a and 20b transmitting the content data, and changes the code rate of the content data being transmitted to the determined code rate.

[0120]

After that, when the present time reaches the reproduction start time T_s, the terminal device 20a and the terminal device 20b each determine "Yes" at step S304 of Fig. 6 and proceeds to step S307 to start reproduction of content (output of content to the output device) based on the content data stored in the storage device (steps S110a and S110b of Fig. 3).

[0121]

Thus, it is possible to securely match the positions to reproduce the content with each other between the plurality of terminal devices 20a and 20b. That is to say, it is possible to cause the plurality of terminal devices 20a and 20b to reproduce the same content synchronously with each other.

[0122]

Further, at this moment, the server device 10 determines "Yes" at step S401 of Fig. 10 and ends execution of the code rate change control program.

[0123]

Thus, the distribution system 1 changes each of the code rates of the content data transmitted from the server device 10 to the terminal devices 20a and 20b based on both the remaining time and the available reproduction time. Consequently, in a case that the available reproduction time is relatively short and the remaining time is considerably long, the distribution system 1 can set the code rate to a relatively large value. As a result, it is possible to avoid meaninglessly lowering the code rate.

[0124]

Further, in a case that the available reproduction time is relatively long and the remaining time is considerably short, the distribution system 1 can set the code rate to a relatively small value. As a result, it is possible to secure a sufficiently long available reproduction time at the reproduction start time. Therefore, the terminal devices 20a and 20b can each securely start reproduction of the content at the set reproduction start time.

[0125]

Thus, according to the distribution system 1, it is possible to cause each of the terminal devices 20a and 20b to securely start reproduction of the content at the set reproduction start time while avoiding meaninglessly lowering the code rate.

[0126]

Furthermore, the distribution system 1 is configured to determine, as a code rate, a value that becomes smaller as the available reproduction time becomes smaller than the target available reproduction time and that becomes smaller as the remaining time becomes shorter.

Thus, it is possible to make the available reproduction time at the reproduction start time

sufficiently close to the target available reproduction time. As a result, it is possible to cause each of the terminal devices 20a and 20b to securely start reproduction of the content at the set reproduction start time while avoiding meaninglessly lowering the code rate.

[0127]

In addition, the distribution system 1 is configured to acquire a communication speed, which is the data amount of content data transmitted from the server device 10 to each of the terminal devices 20a and 20b per unit time, and determine the result of dividing the result of multiplying the acquired communication speed and the remaining time by the result of subtracting the available reproduction time from the target available reproduction time, as a code rate.

Thus, it is possible to make the available reproduction time at the reproduction start time close to the target available reproduction time with more security.

[0128]

Furthermore, the distribution system 1 is configured to set a reproduction start time based on a target available reproduction time, which is a target value of an available reproduction time.

Thus, it is possible to make an available reproduction time at reproduction start time close to a target available reproduction time with security.

[0129]

In addition, the distribution system 1 is configured to, for each of the plurality of terminal devices 20a and 20b, calculate an each-device reproduction preparation time, which is a time required for the terminal device to start reproduction of content, and set reproduction start

time based on the maximum value of the calculated each-device reproduction preparation time.

[0130]

Consequently, all of the plurality of terminal devices 20a and 20b can securely make a target available reproduction time close to an available reproduction time before reproduction start time. As a result, it is possible to securely match the positions to reproduce content with each other between the plurality of terminal devices 20a and 20b.

[0131]

Furthermore, the distribution system 1 is configured to set reproduction start time based on an activation time, which is a time required for activation of an application program that the terminal devices 20a and 20b each execute to reproduce content, and a target available reproduction time.

Thus, the terminal devices 20a and 20b can each securely start reproduction of content at the reproducible start time.

[0132]

In addition, the distribution system 1 is configured to set reproduction start time based on a communication speed, which is the data amount of content data transmitted from the server device 10 to each of the terminal devices 20a and 20b per unit time, and a target available reproduction time.

Thus, it is possible to properly set the reproduction start time.

[0133]

Assuming, in a state that the terminal devices 20a and 20b reproduce the same content synchronously with each other, the user of the terminal device 20c wants the terminal device 20c

to reproduce the content synchronously with the terminal devices 20a and 20b, the description will be continued.

[0134]

In this case, the user of the terminal device 20c inputs a session participation instruction. Consequently, the terminal device 20c transmits a session participation request including the session ID "S01," terminal ID "R03," activation time "1500" (ms) and communication speed "8" (Mbps) having been received to the server device 10 (step S301 of Fig. 6, step S501 of Fig. 13).

[0135]

Upon reception of the session participation request from the terminal device 20c, the server device 10 adds the activation time and communication speed included in the session participation request to session information including the session ID and terminal ID included in the session participation request among the session information stored in the storage device as shown in Fig. 14.

[0136]

Then, for the terminal device 20c having transmitted the session participation request, the server device 10 specifies a code rate r that is equal to or less than the communication speed and is the closest to the communication speed from among the code rates of the content data stored in the storage device. In this exemplary embodiment, the server device 10 specifies "4 Mbps" as the code rate r for the terminal device 20c.

[0137]

Next, for the terminal device 20c having transmitted the session participation request, the server device 10 calculates the each-device reproduction preparation time T_p based on the

communication speed B and activation time T_a included in the stored session information and the target available reproduction time T_d set in advance (step S203 of Fig. 4).

[0138]

Next, the server device 10 determines the reproduction start time T_s ("13:05:25") based on the calculated each-device reproduction preparation time T_p (step S204 of Fig. 4). Then, as shown in Fig. 15, the server device 10 adds the determined reproduction start time to the session information including the session ID "S01" and the terminal ID "R03."

[0139]

Next, the server device 10 transmits the determined reproduction start time T_s to the terminal device 20c having transmitted the session participation request (step S205 of Fig. 4, step S502 of Fig. 13). Thus, the terminal device 20c receives the reproduction start time T_s from the server device 10 (step S302 of Fig. 6).

[0140]

Then, the server device 10 determines whether the determined reproduction start time T_s is time later than reproduction start time determined based on another session participation request including the same session ID as that of the received session participation request (step S206 of Fig. 4).

[0141]

At this moment, reproduction start time (second reproduction start time) determined based on the session participation request received from the terminal device 20c (a second reception device) is time later than reproduction start time (first reproduction start time) determined based on the session participation requests received from the terminal device 20a (a

first reception device) and the terminal device 20b. Moreover, the session participation requests received from the terminal devices 20a and 20b include the same session ID as the session ID included in the session participation request received from the terminal device 20c. That is to say, the determined reproduction start time T_s is time later than reproduction start time determined based on another session participation request including the same session ID as the received session participation request.

[0142]

Therefore, the server device 10 determines "Yes" and proceeds to step S207 to determine a position behind a head position by a difference between the first reproduction start time and the second reproduction start time, as a transmission start position. Then, the server device 10 proceeds to step S208 and starts transmission of content data from the determined transmission start position to the terminal device 20c (step S503 of Fig. 13).

[0143]

At this moment, content data transmitted by the server device 10 to the terminal device 20c is content data representing content identified by the content ID "C01" included in the session information including the session ID "S01." Moreover, this content data is data coded with a code rate specified based on a communication speed included in the session participation request received from the terminal device 20c.

[0144]

As in the abovementioned case, the terminal device 20c transmits available reproduction time information including an available reproduction time to the server device 10 every time a transmission period elapses (step S504 of Fig. 13).

Then, the server device 10 performs a code rate change control on the terminal device 20c every time receiving available reproduction time information from the terminal device 20c (step S505 of Fig. 13).

[0145]

After that, when the present time reaches the reproduction start time received from the server device 10, the terminal device 20c starts reproduction of content based on the content data stored in the storage device (step S506 of Fig. 13).

[0146]

Consequently, it is possible to securely match the positions to reproduce content with each other among the plurality of terminal devices 20a to 20c. That is to say, it is possible to cause the plurality of terminal devices 20a to 20c to reproduce the same content synchronously with each other.

[0147]

As described above, the distribution system 1 according to the first exemplary embodiment of the present invention makes it possible to cause the terminal devices 20a to 20c to securely start reproduction of content at set reproduction start time while avoiding meaninglessly lowering a code rate.

[0148]

The distribution system 1 according to the first exemplary embodiment is configured so that the server device 10 determines a code rate based on a remaining time and an available reproduction time, but may be configured so that each of the terminal devices 20a to 20c determines a code rate based on a remaining time and an available reproduction time. In this case,

each of the terminal devices 20a to 20c is configured to transmit the determined code rate to the server device 10

[0149]

Further, the distribution system 1 according to the first exemplary embodiment is configured to match the positions to reproduce content to be reproduced by the respective terminal devices 20a to 20c with each other among the terminal devices 20a to 20c, but the positions to reproduce content to be reproduced by the respective terminal devices 20a to 20c may be different from each other.

[0150]

Further, the distribution system 1 according to the first exemplary embodiment may be configured so that content data are transmitted and received among the terminal devices.

Further, the number of the terminal devices included by the distribution system 1 according to the first exemplary embodiment is three, but may be two, four, or more.

[0151]

Each of the functions of the distribution system 1 in the first exemplary embodiment is realized by execution of a program (software) by the CPU, but may be realized by hardware such as a circuit.

[0152]

<Second Exemplary Embodiment>

Next, a communication system according to a second exemplary embodiment of the present invention will be described with reference to Fig. 16.

A distribution system 100 according to the second exemplary embodiment is a system

including a transmission device 110 and a reception device 120 configured to be capable of communicating with each other.

[0153]

The transmission device 110 is equipped with a content transmitting part (a content transmitting means) 111 for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device 120.

The reception device 120 is equipped with a content reproducing part (a content reproducing means) 121 for, while receiving the content data transmitted by the transmission device 110, storing received data of the content data into a storage device and also reproducing the content based on the stored data.

[0154]

The distribution system 100 comprises a code rate determining part (a code rate determining means) 131 for determining the code rate based on a remaining time before reproduction start time set as time at which the reception device 120 starts reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device 120.

[0155]

The content transmitting part 111 is configured to change the code rate of the content data to be transmitted to the reception device 120 to the determined code rate.

The content reproducing means 121 is configured to start reproduction of the content at the set reproduction start time.

[0156]

Accordingly, the distribution system 100 changes a code rate of content data transmitted from the transmission device 110 to the reception device 120 based on both a remaining time and an available reproduction time. Consequently, the distribution system 100 can set the code rate to a relatively large value in a case that the available reproduction time is relatively short and the remaining time is considerably long. As a result, it is possible to avoid meaninglessly lowering the code rate.

[0157]

Further, the distribution system 100 can set the code rate to a relatively small value in a case that the available reproduction time is relatively long and the remaining time is considerably short. As a result, it is possible to secure a sufficiently large available reproduction time at reproduction start time. Therefore, the reception device 120 can securely start reproduction of content at the set reproduction start time.

[0158]

Thus, according to the distribution system 100, it is possible to cause the reception device 120 to securely start reproduction of the content at the set reproduction start time while avoiding meaninglessly lowering the code rate.

[0159]

In this case, it is preferred that the code rate determining means is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

[0160]

Accordingly, it is possible to make the available reproduction time at the reproduction start time close to a target available reproduction time with sufficiency. As a result, it is possible to cause the reception device to securely start reproduction of the content at the set reproduction start time while avoiding meaninglessly lowering the code rate.

[0161]

In this case, it is preferred that the code rate determining means is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

[0162]

The degree of increase of the available reproduction time varies with a communication speed. Therefore, by configuring the distribution system as described above, it is possible to more securely make the available reproduction time at the reproduction start time close to the target available reproduction time.

[0163]

In this case, it is preferred that the code rate determining means is configured to determine the code rate with every change period set in advance.

[0164]

In this case, it is preferred that the distribution system includes a plurality of the

reception devices and comprises a synchronous reproduction controlling means for matching reproduction positions of the content to be reproduced by the plurality of the reception devices, respectively, with each other among the plurality of the reception devices.

[0165]

Accordingly, it is possible to securely match positions to reproduce the content with each other among a plurality of reception devices.

[0166]

In this case, it is preferred that the distribution system comprises a reproduction start time setting means for setting the reproduction start time based on a target available reproduction time, which is a target value of the available reproduction time.

[0167]

As the target available reproduction time increases, a time required for the available reproduction time to coincide with the target available reproduction time increases. Therefore, as in the configuration described above, by setting the reproduction start time based on the target available reproduction time, it is possible to securely make the available reproduction time at the reproduction start time close to the target available reproduction time.

[0168]

In this case, it is preferred that the content transmitting means is configured to, when second reproduction start time, which is reproduction start time set for a second reception device as one of the plurality of the reception devices, is later than first reproduction start time, which is reproduction start time set for a first reception device as another one of the plurality of the reception devices, estimate a reproduction position of the content being reproduced by the first

reception device at the second reproduction start time and transmit a portion of the content data at and after the estimated reproduction position to the second reception device.

[0169]

In this case, it is preferred that the reproduction start time setting means is configured to, for each reception device of the plurality of the reception devices, calculate an each-device reproduction preparation time as a time required for the reception device to start reproduction of the content and set the reproduction start time based on a maximum value of the calculated each-device reproduction preparation time.

[0170]

Reception speeds often vary with reception devices. Therefore, by configuring the distribution system as described above, all of the reception devices can securely make the available reproduction times close to the target available reproduction times. As a result, it is possible to securely match positions to reproduce the content with each other among the reception devices.

[0171]

In this case, it is preferred that the reproduction start time setting means is configured to set the reproduction start time based on an activation time, which is a time required for activation of an application program to be executed by the reception device for reproduction of the content, and the target available reproduction time.

[0172]

A time required for the reception device to start reproduction of the content includes an activation time and a time required for the available reproduction time to reach the target

available reproduction time. Therefore, by configuring the distribution system as described above, it is possible to cause the reception device to securely start reproduction of the content at the reproduction start time.

[0173]

In this case, it is preferred that the reproduction start time setting means is configured to set the reproduction start time based on a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time, and the target available reproduction time.

[0174]

The time required for the available reproduction time to reach the target available reproduction time varies with the communication speed. Therefore, by configuring the distribution system as described above, it is possible to properly set the reproduction start time.

[0175]

Further, a distribution method of another exemplary embodiment of the present invention is a method that is applied to a distribution system including a transmission device and a reception device configured to be capable of communicating with each other and that comprises:

transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device, by the transmission device;

while receiving the content data transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the

stored data, by the reception device;

determining the code rate based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device;

changing the code rate of the content data to be transmitted to the reception device to the determined code rate, by the transmission device; and

starting reproduction of the content at the set reproduction start time, by the reception device.

[0176]

In this case, it is preferred that the distribution method comprises determining a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

[0177]

In this case, it is preferred that the distribution method comprises:

acquiring a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time; and

determining a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

[0178]

In this case, it is preferred that the distribution method comprises determining the code rate with every change period set in advance.

[0179]

In this case, it is preferred that the distribution method is applied to the distribution system including a plurality of the reception devices and comprises matching reproduction positions of the content to be reproduced by the plurality of the reception devices, respectively, with each other among the plurality of the reception devices.

[0180]

Further, a transmission device of another exemplary embodiment of the present invention is a device configured to be capable of communicating with a reception device.

The transmission device comprises a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device.

The content transmitting means is configured to change the code rate of the content data to be transmitted to the reception device to a code rate determined based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

[0181]

In this case, it is preferred that the transmission device comprises a code rate determining means for determining the code rate based on the remaining time and the available

reproduction time.

[0182]

In this case, it is preferred the code rate determining means is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

[0183]

In this case, it is preferred that the code rate determining means is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

[0184]

In this case, it is preferred that the code rate determining means is configured to determine the code rate with every change period set in advance.

[0185]

Further, a program of another exemplary embodiment of the present invention comprises instructions for causing a transmission device configured to be capable of communicating with a reception device to realize a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device.

The content transmitting means is configured to change the code rate of the content data to be transmitted to the reception device to a code rate determined based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

[0186]

Further, a reception device of another exemplary embodiment of the present invention is a device configured to be capable of communicating with a transmission device.

The reception device comprises:

a content reproducing means for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means for determining the code rate based on a remaining time before reproduction start time set as time to start reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device.

The content reproducing means is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

[0187]

In this case, it is preferred that the code rate determining means is configured to

determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

[0188]

In this case, it is preferred that the code rate determining means is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

[0189]

In this case, it is preferred that the code rate determining means is configured to determine the code rate with every change period set in advance.

[0190]

A program of another exemplary embodiment of the present invention comprises instructions for causing a reception device configured to be capable of communicating with a transmission device to realize:

a content reproducing means for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means for determining the code rate based on a remaining time

before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device

The content reproducing means is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

[0191]

Inventions of a distribution method, a transmission device, a program and a reception device having the aforementioned configurations have the same actions as the distribution system described above, and therefore, can achieve the object of the present invention mentioned above.

[0192]

[0193]

Further, the program is stored in the storage device in the respective exemplary embodiments, but may be stored in a computer-readable storage medium. For example, the recording medium is a portable medium such as a flexible disk, an optical disk, a magneto-optical disk and a semiconductor memory.

[0194]

Further, as modified examples of the exemplary embodiments, any combination of the exemplary embodiments and modified examples may be employed.

[0195]

The present invention is based upon and claims the benefit of priority from Japanese patent application No. 2009-253581, filed on November 5, 2009.

INDUSTRIAL APPLICABILITY

[0196]

The present invention can be applied to, for example, a distribution system that transmits content data representing content from a transmission device to a reception device.

DESCRIPTION OF REFERENCE NUMERALS

[0197]

1 distribution system

10 server device

20a, 20b, 20c terminal device

31 request transmission part

32 synchronous reproduction controlling part

32a reproduction start time reception part

33 content reproducing part

33a content reception part

33b buffer part

33c content reproduction execution part

34 available reproduction time transmission part

41 request reception part

42 session information storage part

43 reproduction start time setting part

43a reproduction start time determination part

43b reproduction start time transmission part

44 content data storage part

45 content transmitting part

46 available reproduction time reception part

47 code rate determining part

100 distribution system

110 transmission device

111 content transmitting part

120 reception device

121 content reproducing part

131 code rate determining part

NW communication line

EP 10 828 052.0
NBA 038 WO/EP
February, 2016

NEW CLAIMS

1. A distribution system (100), including a transmission device (110) and a reception device (120) configured to be capable of communicating with each other,

the transmission device (110) being equipped with a content transmitting means (111) for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device (120), and

the reception device (120) being equipped with a content reproducing means (121) for, while receiving the content data transmitted by the transmission device (110), storing received data of the content data into a storage device and also reproducing the content based on the stored data,

the distribution system, comprising a code rate determining means (131) for determining the code rate based on a remaining time before reproduction start time set for the reception device (120) as time at which the reception device (120) starts reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120), wherein:

the content transmitting means (111) is configured to change the code rate of the content data to be transmitted to the reception device (120) to the determined code rate; and

the content reproducing means (121) is configured to start reproduction of the content at the set reproduction start time.

2. The distribution system according to Claim 1, wherein the code rate determining means (131) is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

3. The distribution system according to Claim 2, wherein the code rate determining means (131) is configured to acquire a communication speed, which is a data amount

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of the content data transmitted from the transmission device (110) to the reception device (120) per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

4. The distribution system according to any of Claims 1 to 3, wherein the code rate determining means (131) is configured to determine the code rate with every change period set in advance.

5. The distribution system according to any of Claims 1 to 4, including a plurality of the reception devices (20a, 20b, 20c),

the distribution system, comprising a synchronous reproduction controlling means (32) for matching reproduction positions of the content to be reproduced by the plurality of the reception devices (20a, 20b, 20c), respectively, with each other among the plurality of the reception devices (20a, 20b, 20c).

6. The distribution system according to Claim 5, comprising a reproduction start time setting means (43) for setting the reproduction start time based on a target available reproduction time, which is a target value of the available reproduction time.

7. The distribution system according to Claim 5 or 6, wherein the content transmitting means (45) is configured to, when second reproduction start time, which is reproduction start time set for a second reception device as one of the plurality of the reception devices (20a, 20b, 20c), is later than first reproduction start time, which is reproduction start time set for a first reception device as another one of the plurality of the reception devices (20a, 20b, 20c), estimate a reproduction position of the content being reproduced by the first reception device at the second reproduction start time and transmit a portion of the content data at and after the estimated reproduction position to the second reception device.

8. The distribution system according to Claim 6 or 7, wherein the reproduction start time setting means (43) is configured to, for each reception device of the plurality of the reception devices (20a, 20b, 20c), calculate an each-device reproduction

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preparation time as a time required for the reception device (20a; 20b; 20c) to start reproduction of the content and set the reproduction start time based on a maximum value of the calculated each-device reproduction preparation time.

9. The distribution system according to any of Claims 6 to 8, wherein the reproduction start time setting means (43) is configured to set the reproduction start time based on an activation time, which is a time required for activation of an application program to be executed by the reception device (20a; 20b; 20c) for reproduction of the content, and the target available reproduction time.

10. The distribution system according to any of Claims 6 to 9, wherein the reproduction start time setting means (43) is configured to set the reproduction start time based on a communication speed, which is a data amount of the content data transmitted from the transmission device (10) to the reception device (20a; 20b; 20c) per unit time, and the target available reproduction time.

11. A distribution method applied to a distribution system including a transmission device and a reception device configured to be capable of communicating with each other, the distribution method comprising:

transmitting content data (S503), which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device, by the transmission device;

while receiving the content data transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data, by the reception device;

determining the code rate (S504) based on a remaining time before reproduction start time set for the reception device (120) as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device;

changing the code rate (S505) of the content data to be transmitted to the reception device to the determined code rate, by the transmission device; and

starting reproduction of the content (S506) at the set reproduction start time, by the reception device.

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12. The distribution method according to Claim 11, comprising:

determining a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

13. The distribution method according to Claim 12, comprising:

acquiring a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time; and

determining a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

14. The distribution method according to any of Claims 11 to 13, comprising:

determining the code rate with every change period set in advance.

15. The distribution method according to any of Claims 11 to 14, applied to the distribution system including a plurality of the reception devices, the distribution method comprising:

matching reproduction positions of the content to be reproduced by the plurality of the reception devices, respectively, with each other among the plurality of the reception devices.

16. A transmission device (110) configured to be capable of communicating with a reception device (120), the transmission device (110) comprising:

a content transmitting means (111) for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device (120),

wherein the content transmitting means (111) is configured to change the code rate of the content data to be transmitted to the reception device (120) to a code rate determined based on a remaining time before reproduction start time set for the reception device (120) as time at which the reception device (120) starts reproduction

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of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120).

17. The transmission device (110) according to Claim 16, comprising:

a code rate determining means (131) for determining the code rate based on the remaining time and the available reproduction time.

18. The transmission device (110) according to Claim 16 or 17, wherein the code rate determining means (131) is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

19. The transmission device (110) according to Claim 18, wherein the code rate determining means (131) is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device (110) to the reception device per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

20. The transmission device (110) according to any of Claims 16 to 19, wherein the code rate determining means (131) is configured to determine the code rate with every change period set in advance.

21. A program comprising instructions for causing a transmission device (110) configured to be capable of communicating with a reception device (120) to realize a content transmitting means (111) for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device (120),

wherein the content transmitting means (111) is configured to change the code rate of the content data to be transmitted to the reception device (120) to a code rate determined based on a remaining time before reproduction start time set for the

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reception device (120) as time at which the reception device (120) starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120).

22. A reception device (120) configured to be capable of communicating with a transmission device (110), the reception device (120) comprising:

a content reproducing means (121) for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device (110), storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means (131) for determining the code rate based on a remaining time before reproduction start time set for the reception device (120) as time to start reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device,

wherein the content reproducing means (121) is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

23. The reception device (120) according to Claim 22, wherein the code rate determining means (131) is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

24. The reception device (120) according to Claim 23, wherein the code rate determining means (131) is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device (110) to the reception device (120) per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

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25. The reception device (120) according to any of Claims 22 to 24, wherein the code rate determining means (131) is configured to determine the code rate with every change period set in advance.

26. A program comprising instructions for causing a reception device (120) according to any of Claims 22 to 25 to communicate with a transmission device (110) according to any of Claims 16 to 20.

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Fig.1

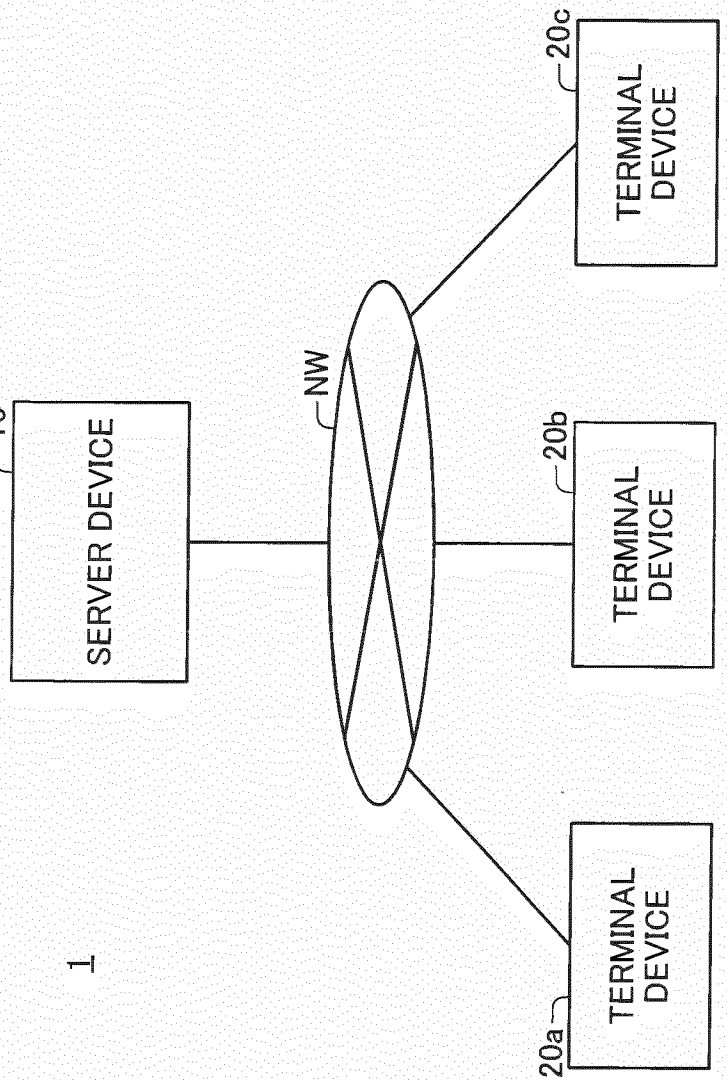

1
SERVER DEVICE
10
NW
TERMINAL DEVICE
20a
TERMINAL DEVICE
20b
TERMINAL DEVICE
20c

Fig.2

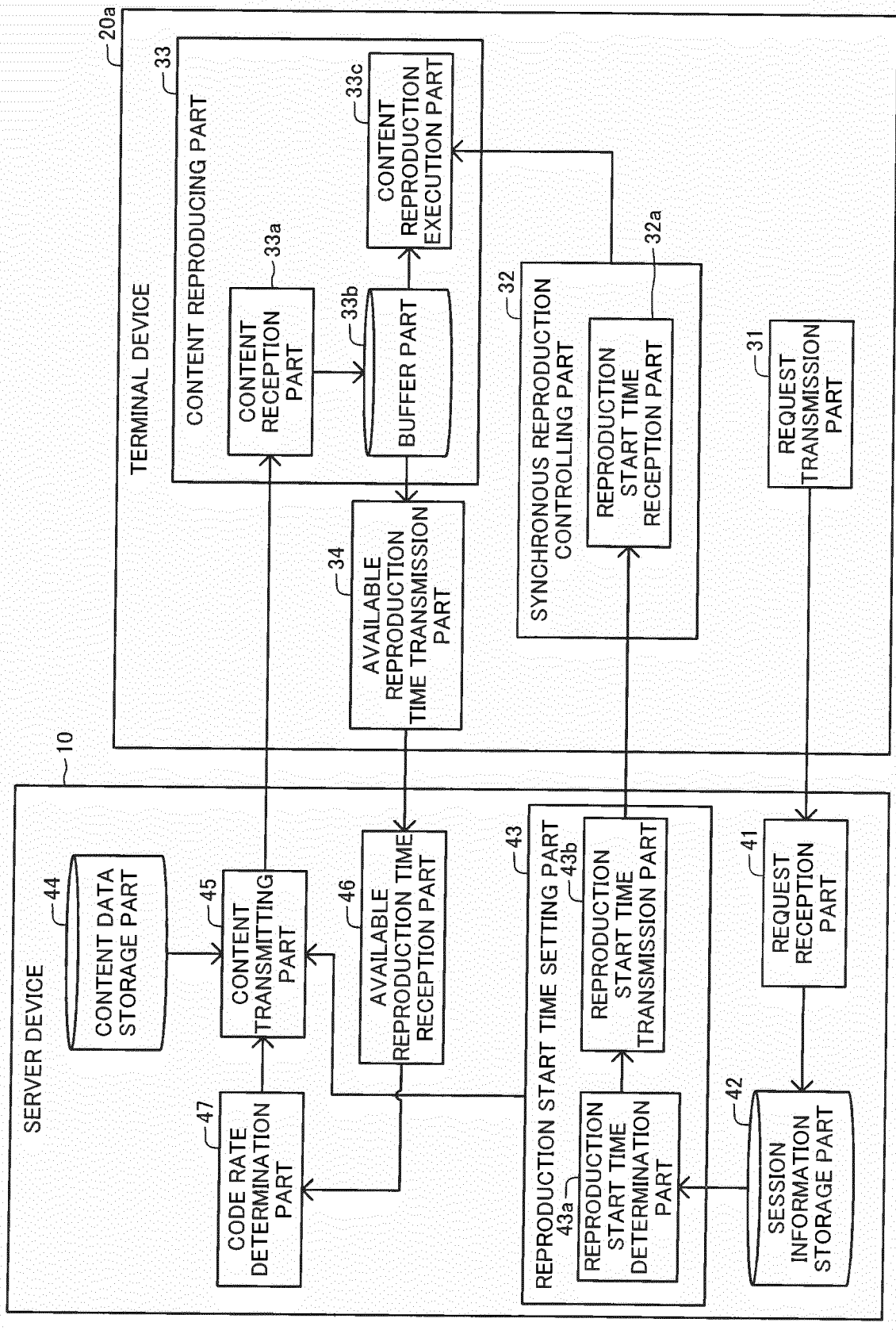

20a
TERMINAL DEVICE
33
CONTENT REPRODUCING PART
33a
CONTENT RECEPTION PART
33b
BUFFER PART
33c
CONTENT REPRODUCTION EXECUTION PART
34
AVAILABLE REPRODUCTION TIME TRANSMISSION PART
32
SYNCHRONOUS REPRODUCTION CONTROLLING PART
32a
REPRODUCTION START TIME RECEPTION PART
31
REQUEST TRANSMISSION PART
10
SERVER DEVICE
44
CONTENT DATA STORAGE PART
45
CONTENT TRANSMITTING PART
46
AVAILABLE REPRODUCTION TIME RECEPTION PART
43
REPRODUCTION START TIME SETTING PART
43b
REPRODUCTION START TIME TRANSMISSION PART
41
REQUEST RECEPTION PART
47
CODE RATE DETERMINATION PART
43a
REPRODUCTION START TIME DETERMINATION PART
42
SESSION INFORMATION STORAGE PART

Fig.3

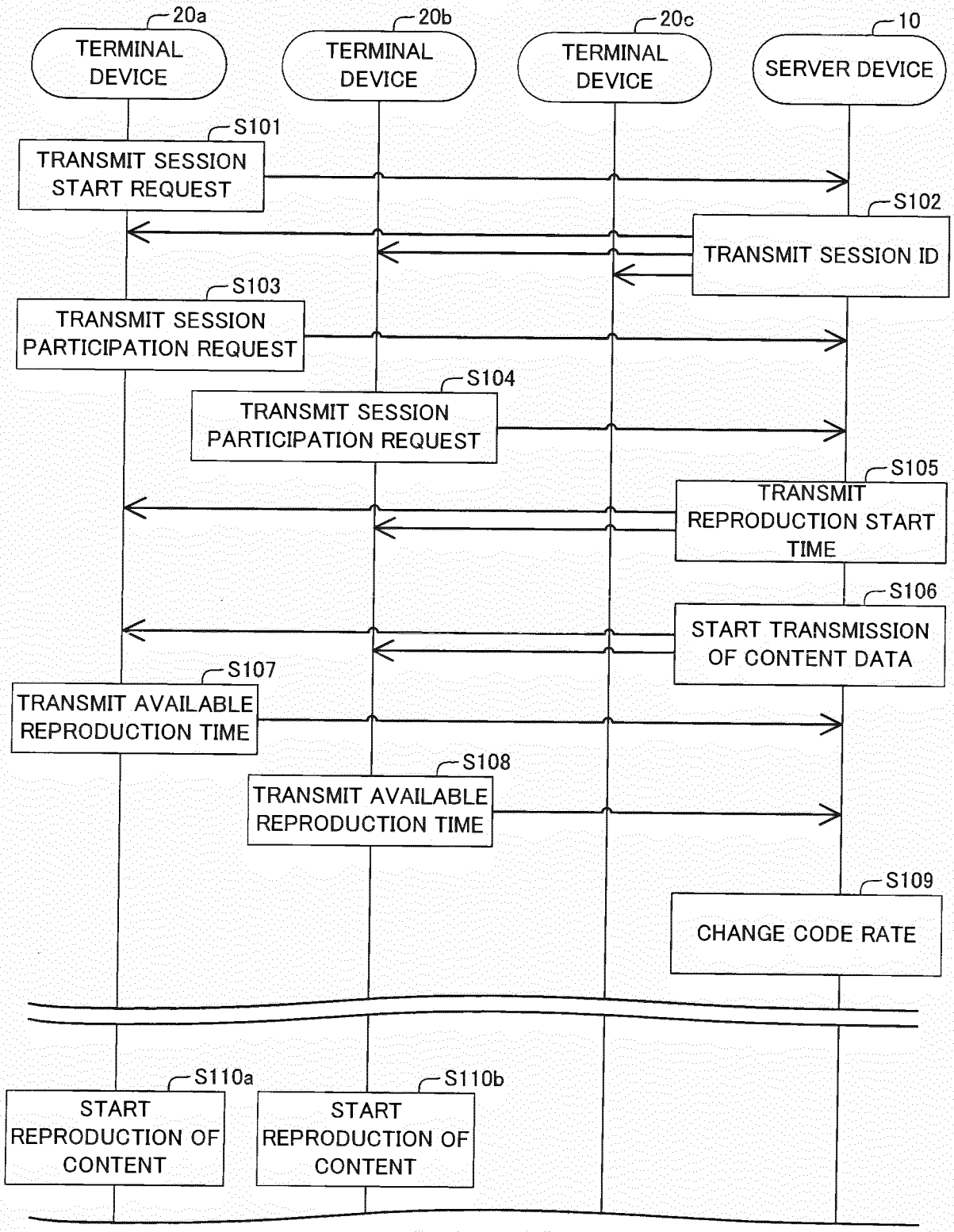

20a
TERMINAL DEVICE
20b
TERMINAL DEVICE
20c
TERMINAL DEVICE
10
SERVER DEVICE
S101
TRANSMIT SESSION START REQUEST
S102
TRANSMIT SESSION ID
S103
TRANSMIT SESSION PARTICIPATION REQUEST
S104
TRANSMIT SESSION PARTICIPATION REQUEST
S105
TRANSMIT REPRODUCTION START TIME
S106
START TRANSMISSION OF CONTENT DATA
S107
TRANSMIT AVAILABLE REPRODUCTION TIME
S108
TRANSMIT AVAILABLE REPRODUCTION TIME
S109
CHANGE CODE RATE
S110a
START REPRODUCTION OF CONTENT
S110b
START REPRODUCTION OF CONTENT

Fig.4

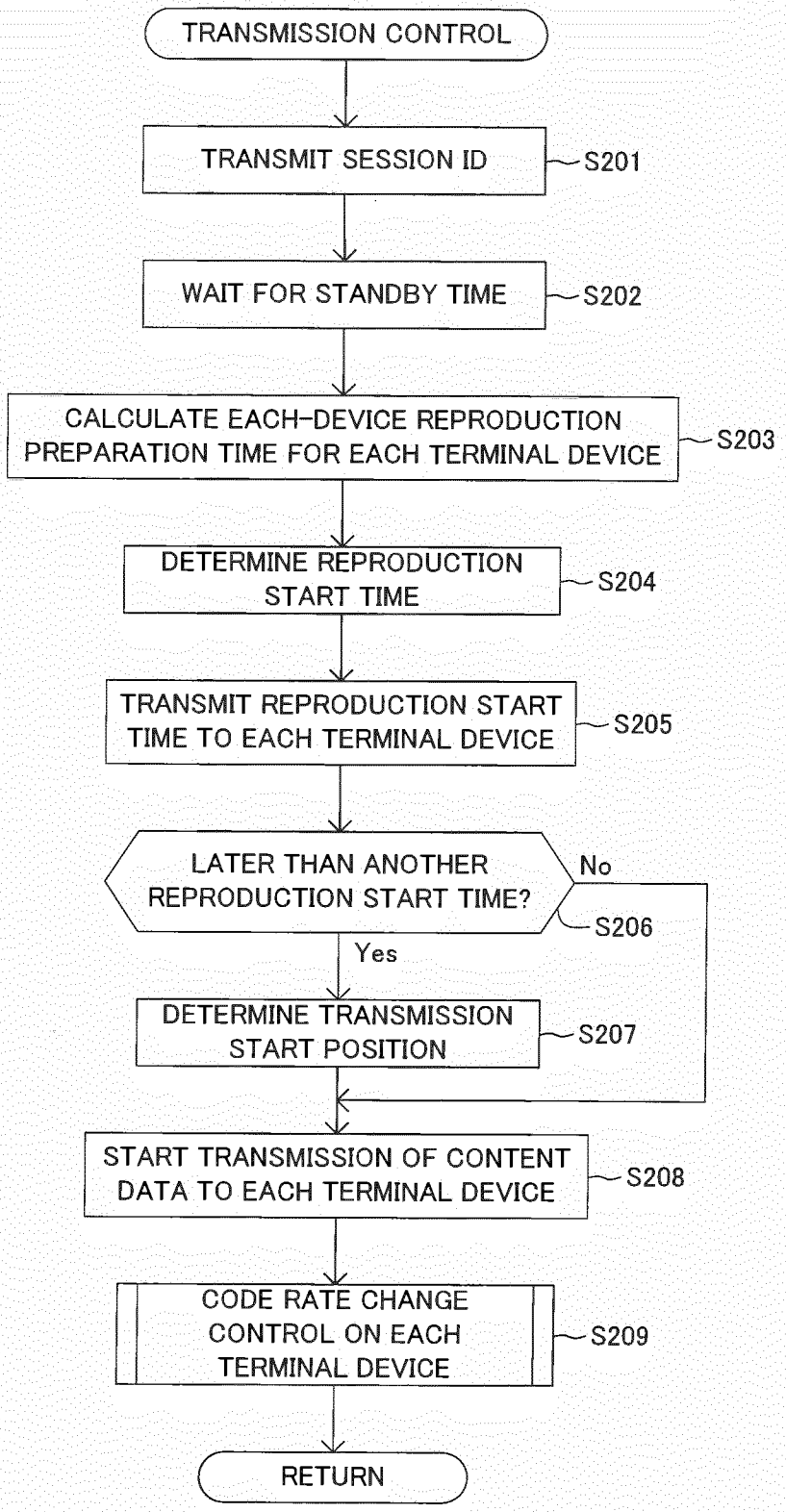

TRANSMISSION CONTROL
TRANSMIT SESSION ID
S201
WAIT FOR STANDBY TIME
S202
CALCULATE EACH-DEVICE REPRODUCTION PREPARATION TIME FOR EACH TERMINAL DEVICE
S203
DETERMINE REPRODUCTION START TIME
S204
TRANSMIT REPRODUCTION START TIME TO EACH TERMINAL DEVICE
S205
LATER THAN ANOTHER REPRODUCTION START TIME?
No
S206
Yes
DETERMINE TRANSMISSION START POSITION
S207
START TRANSMISSION OF CONTENT DATA TO EACH TERMINAL DEVICE
S208
CODE RATE CHANGE CONTROL ON EACH TERMINAL DEVICE
S209
RETURN

Fig.5

SESSION ID	CONTENT ID	TERMINAL ID	ACTIVATION TIME	COMMUNICATION SPEED	REPRODUCTION START TIME
S01	C01	R01			
S01	C01	R02			
S01	C01	R03			
...	...	...	...	...	...

Fig.6

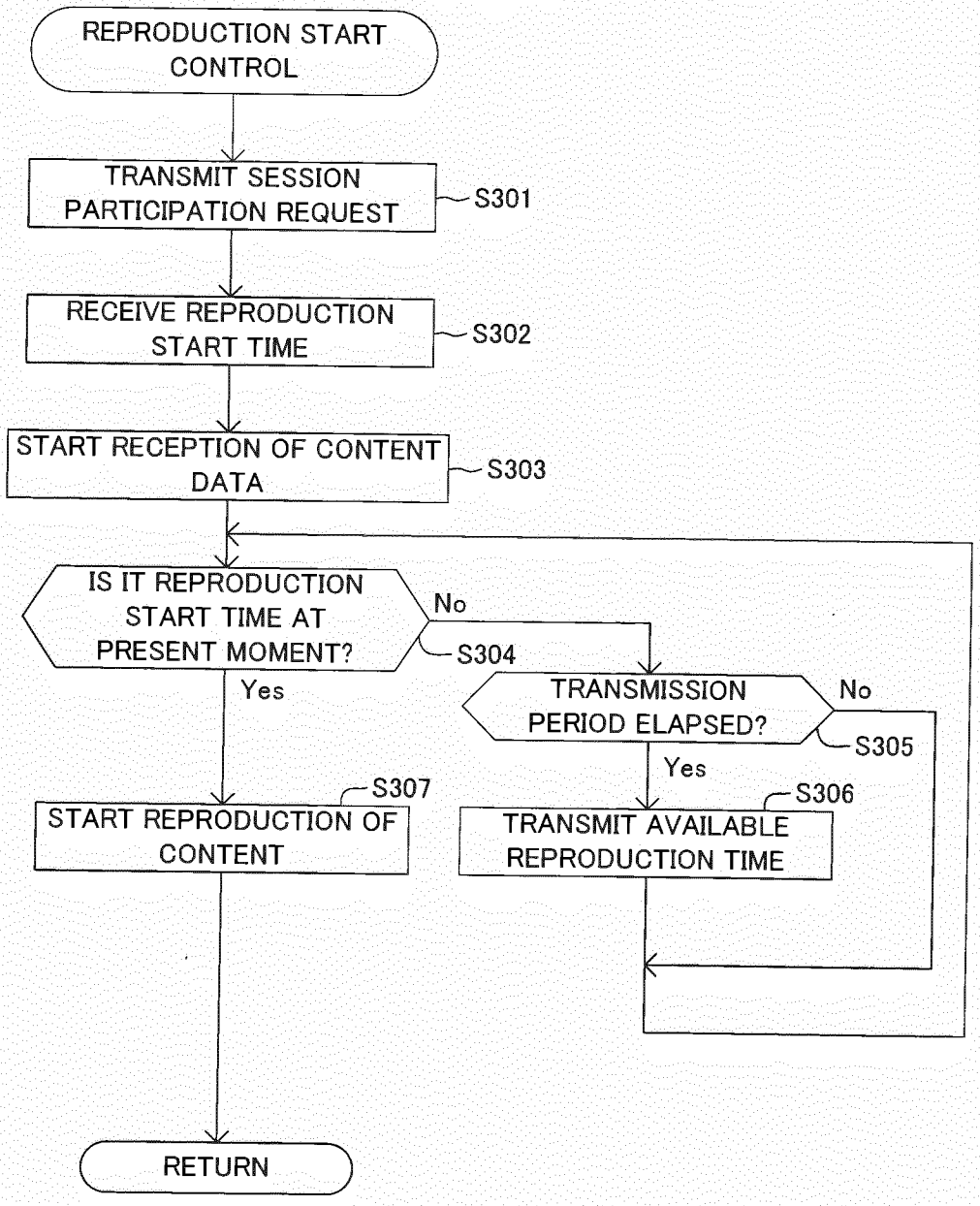

REPRODUCTION START CONTROL
TRANSMIT SESSION PARTICIPATION REQUEST
S301
RECEIVE REPRODUCTION START TIME
S302
START RECEPTION OF CONTENT DATA
S303
IS IT REPRODUCTION START TIME AT PRESENT MOMENT?
S304
No
Yes
TRANSMISSION PERIOD ELAPSED?
No
S305
Yes
S306
TRANSMIT AVAILABLE REPRODUCTION TIME
S307
START REPRODUCTION OF CONTENT
RETURN

Fig.7

SESSION ID	CONTENT ID	TERMINAL ID	ACTIVATION TIME	COMMUNICATION SPEED	REPRODUCTION START TIME
S01	C01	R01	1200	3	
S01	C01	R02	1000	50	
S01	C01	R03			
⋮	⋮	⋮	⋮	⋮	⋮

Fig.8

SESSION ID	CONTENT ID	TERMINAL ID	ACTIVATION TIME	COMMUNICATION SPEED	REPRODUCTION START TIME
S01	C01	R01	1200	3	13:01:34
S01	C01	R02	1000	50	13:01:34
S01	C01	R03			
⋮	⋮	⋮	⋮	⋮	⋮

Fig.9

SESSION ID	TERMINAL ID	AVAILABLE REPRODUCTION TIME	REMAINING TIME	CODE RATE
S01	R01	0	31	2
S01	R02	0	31	50
⋮	⋮	⋮	⋮	⋮

Fig.10

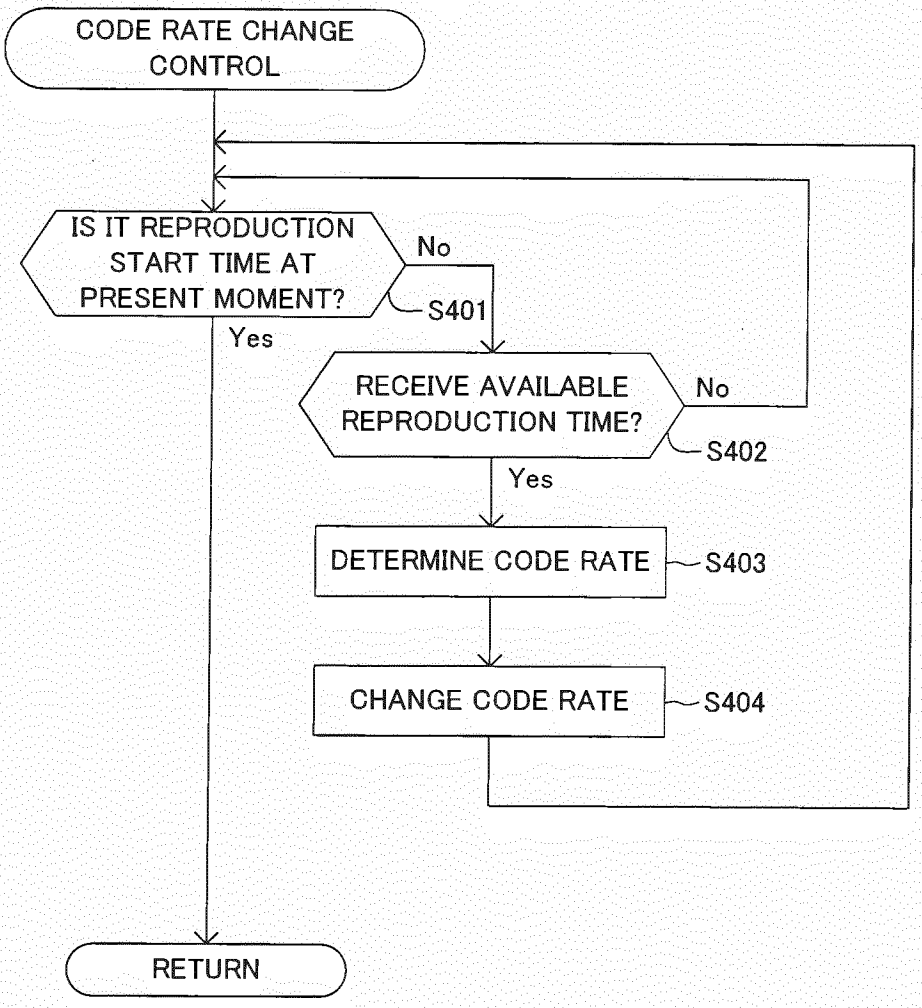

CODE RATE CHANGE CONTROL
IS IT REPRODUCTION START TIME AT PRESENT MOMENT?
No
S401
Yes
RECEIVE AVAILABLE REPRODUCTION TIME?
No
S402
Yes
DETERMINE CODE RATE
S403
CHANGE CODE RATE
S404
RETURN

Fig.11

SESSION ID	TERMINAL ID	AVAILABLE REPRODUCTION TIME	REMAINING TIME	CODE RATE
S01	R01	0	31	2
S01	R02	0	31	50
S01	R01	7	26	2
S01	R02	2	26	16
...	...	...	...	...

Fig.12

SESSION ID	TERMINAL ID	AVAILABLE REPRODUCTION TIME	REMAINING TIME	CODE RATE
S01	R01	0	31	2
S01	R02	0	31	50
S01	R01	7	26	2
S01	R02	2	26	16
S01	R01	18	21	4
S01	R02	14	21	50
⋮	⋮	⋮	⋮	⋮

Fig.13

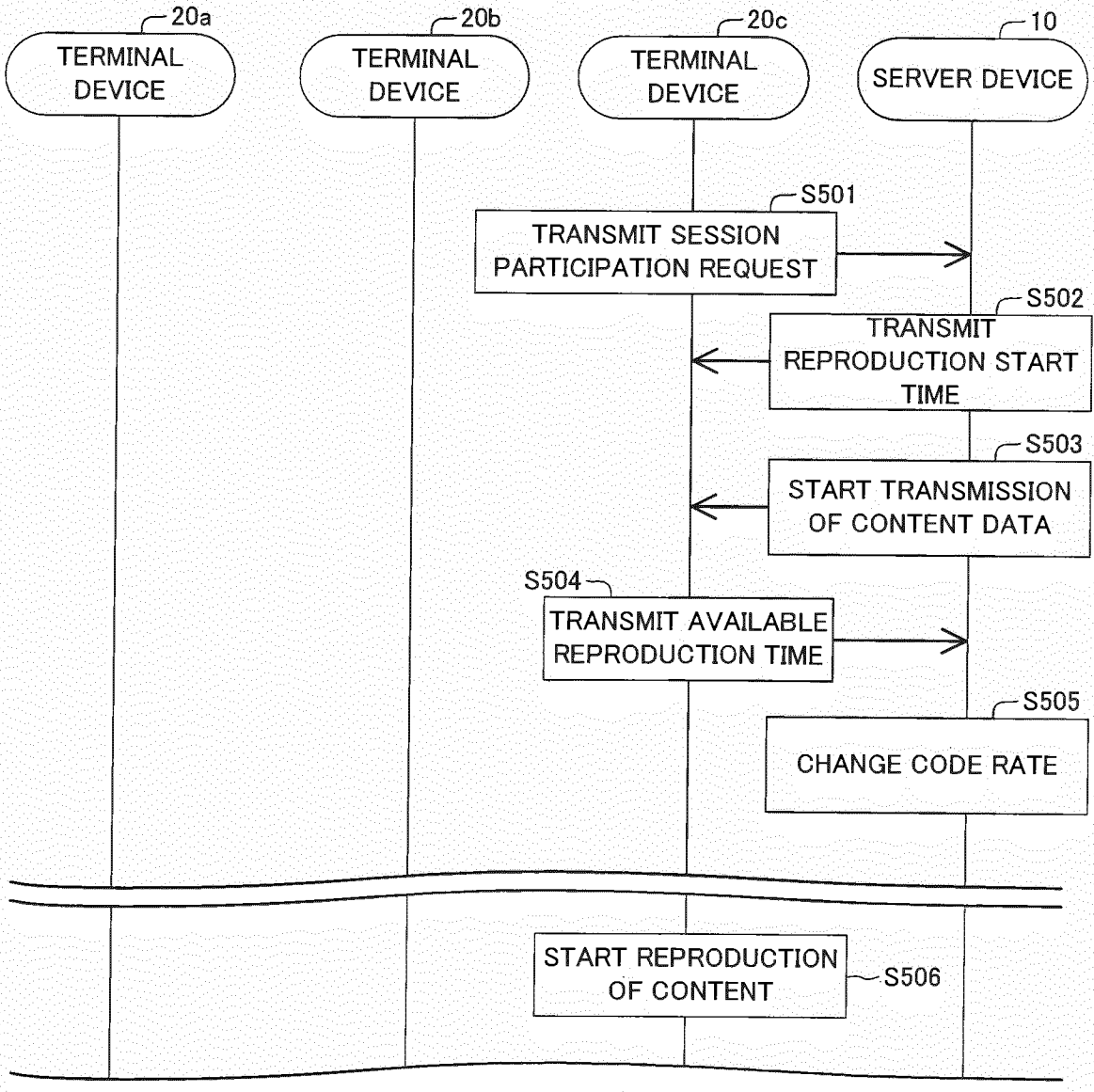

20a
TERMINAL DEVICE
20b
TERMINAL DEVICE
20c
TERMINAL DEVICE
10
SERVER DEVICE
S501
TRANSMIT SESSION PARTICIPATION REQUEST
S502
TRANSMIT REPRODUCTION START TIME
S503
START TRANSMISSION OF CONTENT DATA
S504
TRANSMIT AVAILABLE REPRODUCTION TIME
S505
CHANGE CODE RATE
START REPRODUCTION OF CONTENT
S506

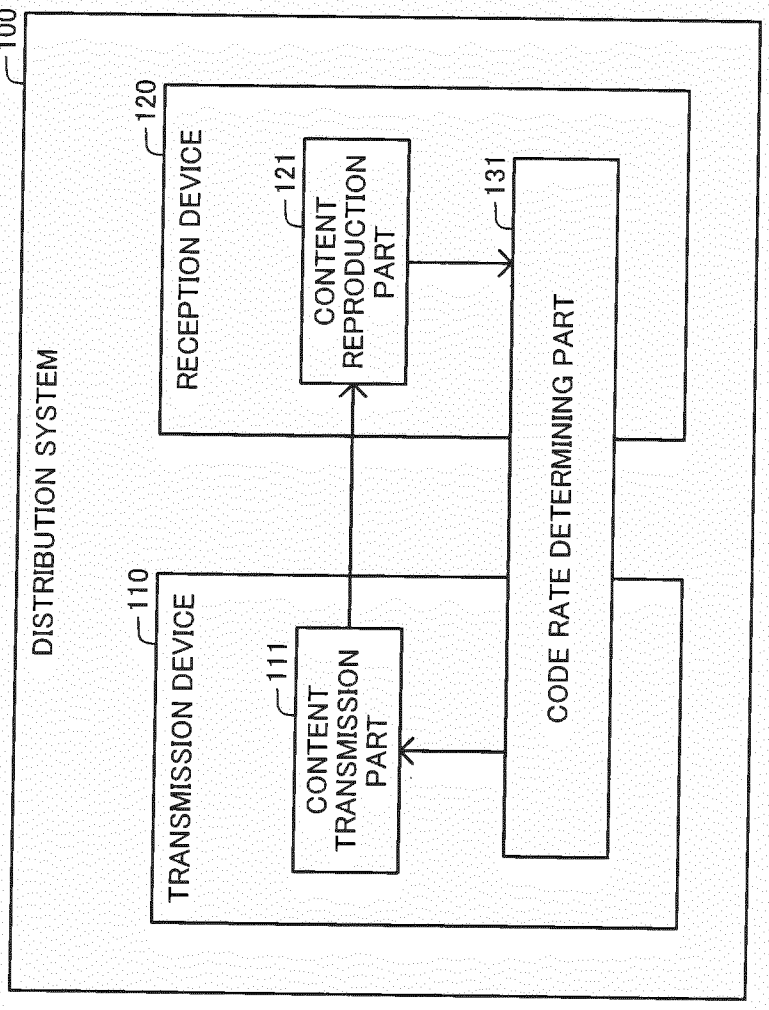
Fig.14

SESSION ID	CONTENT ID	TERMINAL ID	ACTIVATION TIME	COMMUNICATION SPEED	REPRODUCTION START TIME
S01	C01	R01	1200	3	13:01:34
S01	C01	R02	1000	50	13:01:34
S01	C01	R03	1500	8	
⋮	⋮	⋮	⋮	⋮	⋮

Fig.15

SESSION ID	CONTENT ID	TERMINAL ID	ACTIVATION TIME	COMMUNICATION SPEED	REPRODUCTION START TIME
S01	C01	R01	1200	3	13:01:34
S01	C01	R02	1000	50	13:01:34
S01	C01	R03	1500	8	13:05:25
⋮	⋮	⋮	⋮	⋮	⋮

Fig.16


100
DISTRIBUTION SYSTEM
120
RECEPTION DEVICE
121
CONTENT REPRODUCTION PART
131
CODE RATE DETERMINING PART
110
TRANSMISSION DEVICE
111
CONTENT TRANSMISSION PART

DESCRIPTION

TITLE: DISTRIBUTION SYSTEM

TECHNICAL FIELD

[0001]

The present invention relates to a distribution system that transmits content data representing content from a transmission device to a reception device.

BACKGROUND ART

[0002]

There is a known distribution system that includes a transmission device and a plurality of reception devices configured to be capable of communicating with each other and allows the plurality of reception devices to synchronously reproduce content. As one of this type of distribution systems, a distribution system described in Patent Document 1 matches time of a clock disposed to each of the plurality of reception devices with time of a reference clock. Moreover, the transmission device transmits reproduction start time, which is time that the reception device starts reproduction of content, to each reception terminal.

[0003]

Then, the transmission device transmits content data representing content (video, audio, etc.) to each of the reception devices. Each of the reception devices stores received data among the content data into a storage device (a buffer) while receiving the content data. Moreover, each

of the reception devices starts reproduction of content based on the stored data at the reproduction start time. As a result, it is possible to match the positions to reproduce the content with each other among the plurality of reception devices.

[0004]

Further, a distribution system described in Patent Document 2 is a system that allows a plurality of reception devices to synchronously reproduce content even if time to start reproduction of the content varies depending on the reception device. In this distribution system, while a first reception device is reproducing content, a second reception device estimates a time required to start reproduction of the content and determines reproduction start time based on the estimated time. Then, the second reception device transmits the determined reproduction start time to the transmission device.

[0005]

Consequently, the transmission device transmits, to the second reception device, content data to be transmitted to the first reception device at and after the reproduction start time. Then, the second reception device starts reproduction of content based on the stored data at the reproduction start time. As a result, it is possible to match positions to reproduce content with each other between the first reception device and the second reception device.

[0006]

[Patent Document 1] Japanese Unexamined Patent Application Publication No. 2005-191786

[Patent Document 2] Japanese Unexamined Patent Application Publication No. 2007-13705

[0007]

While the reception device is receiving content data, the amount of data that the reception device receives from the transmission device per unit time (i.e., a communication speed) varies depending on the status of use of a communication line, and so on. Therefore, when the communication speed becomes extremely low, there is a case that the data amount of content data stored in the storage device of the reception device does not reach a sufficient amount by the reproduction start time. In such a case, there is a fear that the reception device cannot start reproduction of content at the reproduction start time.

[0008]

In order to deal with this, it can be considered to configure a distribution system to change a code rate of content data to be transmitted based on an available reproduction time, which is a time that it is possible to reproduce content based on content data stored in the storage device of the reception device.

[0009]

However, during a period between start of reception of content data by the reception device and reproduction start time, the available reproduction time gradually increases from 0. Therefore, in a case that the code rate is determined based on only the available reproduction time, there is a fear that the code rate is set to be extremely small immediately after the reception device starts reception of the content data and, on the other hand, the code rate is set to be extremely high immediately before the reproduction start time.

[0010]

Further, such a problem arises not only in a distribution system in which a plurality of

reception devices synchronously reproduce content but also in a distribution system in which one reception device starts reproduction of content at set reproduction start time.

< insert description page 4a here >

SUMMARY

[0011]

Accordingly, an object of the present invention is to provide a distribution system capable of solving the abovementioned problems, "the code rate may be set to be extremely high" and "the reception device may be unable to start reproduce content at set reproduction start time."

[0012]

In order to achieve the object, a distribution system of an exemplary embodiment of the present invention is a system including a transmission device and a reception device configured to be capable of communicating with each other.

The transmission device is equipped with a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device.

The reception device is equipped with a content reproducing means for, while receiving the content data transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data.

The distribution system comprises a code rate determining means for determining the code rate based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an

US 7 606 928 B2 relates to a method for providing to a sender of RTP packets the actual receiver buffer fullness level in a receiver of the RTP packets at a certain time instant represented as remaining playout duration in time. The receiver sends in an RTCP report the sequence number of a selected RTP packet in the receiver buffer and the time difference between the scheduled playout time of this packet and the current time. Based on this timing information, the sender calculates the amount of time it would take for the receiver buffer to empty if the receiver continues to playout at normal speed and no further RTP packets arrive to the receiver buffer. This receiver buffer fullness level information can be used at the sender to adjust the transmission rate and/or nominal playout rate of the RTP packets in order to maintain a targeted receiver buffer fullness level.

US 2007/133405 A1 relates to a congestion controller for a media server, which monitors both the buffer status of the client device as well as the network performance. The congestion controller may increase or decrease the pacing of packets transmitted over the network based on the fullness of a buffer on the client device, but may also change the bit rate of the packets based on the network performance. By monitoring both the client device status and network performance, the pacing and bit rate of the packets may be varied together to achieve an optimized throughput and maximized user experience of the media.

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available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

The content transmitting means is configured to change the code rate of the content data to be transmitted to the reception device to the determined code rate.

The content reproducing means is configured to start reproduction of the content at the set reproduction start time.

[0013]

Further, a distribution method of another exemplary embodiment of the present invention is a method that is applied to a distribution system including a transmission device and a reception device configured to be capable of communicating with each other and that comprises:

transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device, by the transmission device;

while receiving the content data transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data, by the reception device;

determining the code rate based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device;

changing the code rate of the content data to be transmitted to the reception device to

the determined code rate, by the transmission device; and

starting reproduction of the content at the set reproduction start time, by the reception device.

[0014]

Further, a transmission device of another exemplary embodiment of the present invention is a device configured to be capable of communicating with a reception device.

The transmission device comprises a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device.

The content transmitting means is configured to change the code rate of the content data to be transmitted to the reception device to a code rate determined based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

[0015]

Further, a program of another exemplary embodiment of the present invention comprises instructions for causing a transmission device configured to be capable of communicating with a reception device to realize a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device.

The content transmitting means is configured to change the code rate of the content data

to be transmitted to the reception device to a code rate determined based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

[0016]

Further, a reception device of another exemplary embodiment of the present invention is a device configured to be capable of communicating with a transmission device.

The reception device comprises:

a content reproducing means for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means for determining the code rate based on a remaining time before reproduction start time set as time to start reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device.

The content reproducing means is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

[0017]

Further, a program of another exemplary embodiment of the present invention comprises instructions for causing a reception device configured to be capable of communicating

with a transmission device to realize:

a content reproducing means for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means for determining the code rate based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

The content reproducing means is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

[0018]

With the configurations described above, the present invention enables a reception device to securely start reproduction of content at set reproduction start time while avoiding meaninglessly lowering a code rate.

BRIEF DESCRIPTION OF DRAWINGS

[0019]

Fig. 1 is a diagram showing a schematic configuration of a distribution system according to a first exemplary embodiment of the present invention;

Fig. 2 is a block diagram schematically showing a function of the distribution system

according to the first exemplary embodiment of the present invention;

Fig. 3 is a sequence diagram showing an operation of the distribution system according to the first exemplary embodiment of the present invention;

Fig. 4 is a flowchart showing a transmission control program executed by a server device according to the first exemplary embodiment of the present invention;

Fig. 5 is a table showing session information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 6 is a flowchart showing a reproduction start control program executed by a terminal device according to the first exemplary embodiment of the present invention;

Fig. 7 is a table showing session information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 8 is a table showing session information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 9 is a table showing history information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 10 is a flowchart showing a code rate change control program executed by the server device according to the first exemplary embodiment of the present invention;

Fig. 11 is a table showing history information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 12 is a table showing history information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 13 is a sequence diagram showing an operation of the distribution system according

to the first exemplary embodiment of the present invention;

Fig. 14 is a table showing session information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 15 is a table showing session information stored by the server device according to the first exemplary embodiment of the present invention; and

Fig. 16 is a block diagram schematically showing a function of a distribution system according to a second exemplary embodiment of the present invention.

EXEMPLARY EMBODIMENTS

[0020]

Below, exemplary embodiments of a distribution system, a distribution method, a transmission device, a program and a reception device according to the present invention will be described with reference to Figs. 1 to 16.

[0021]

<First Exemplary Embodiment>

As shown in Fig. 1, a distribution system 1 according to the first exemplary embodiment includes a server device (a transmission device) 10 and a plurality of (in this exemplary embodiment, three) terminal devices (reception devices) 20a, 20b and 20c. The server device 10 and the terminal devices 20a to 20c are connected so as to be capable of communicating with each other via a communication line (in this exemplary embodiment, the Internet) NW.

[0022]

The server device 10 is an information processing device. The server device 10 is

equipped with a central processing unit (CPU) and a storage device (a memory and a hard disk drive (HDD)), which are not shown in the drawings. The server device 10 is configured to realize a function described later by execution of a program stored in the storage device by the CPU.

[0023]

In this exemplary embodiment, the respective terminal devices 20a to 20c are personal computers. The respective terminal devices 20a to 20c may be mobile phone terminals, personal handyphone systems (PHS), personal data assistances (personal digital assistants; PDA), car navigation terminals, game terminals, or the like.

[0024]

The terminal devices 20a to 20c are each equipped with a CPU, a storage device, an input device and an output device. The output device has a display. The output device causes the display to display an image composed of letters, figures and so on based on image information outputted by the CPU. The input device has a keyboard and a mouse. The terminal devices 20a to 20c are each configured so that information based on an operation by a user is inputted via the keyboard and the mouse.

[0025]

The terminal devices 20a to 20c are each configured to realize a function described later by execution of a program stored in the storage device by the CPU.

[0026]

Fig. 2 is a block diagram showing a function of the distribution system 1 configured as described above. Herein, a function of the terminal device 20a among the terminal devices 20a to 20c will be described. The terminal devices 20b and 20c each have the same function as the

terminal device 20a.

[0027]

Further, a function of the distribution system 1 is realized by execution of a program presented with a flowchart shown in Fig. 6 described later, and so on, by the CPU of the terminal device 20a, and by execution of programs presented with flowcharts shown in Figs. 4 and 10, and so on, by the CPU of the server device 10.

[0028]

A function of the terminal device 20a includes a request transmission part 31, a synchronous reproduction controlling part (a synchronous reproduction controlling means) 32, a content reproducing part (a content reproducing means) 33, and an available reproduction time transmission part 34.

[0029]

Further, a function of the server device 10 includes a request reception part 41, a session information storage part 42, a reproduction start time setting part (a reproduction start time setting means) 43, a content data storage part 44, a content transmitting part (a content transmitting means) 45, an available reproduction time reception part 46, and a code rate determining part (a code rate determining means) 47.

[0030]

The request transmission part 31 of the terminal device 20a accepts a session start instruction inputted by the user via the input device. The session start instruction is information of an instruction to start a session. The session start instruction includes content identification information (content ID) for identifying content and other terminal ID, which is terminal

identification information (terminal ID) for identifying another terminal device that synchronously reproduces content.

[0031]

Upon acceptance of the session start instruction, the request transmission part 31 transmits, to the server device 10, a session start request including: the content ID included in the session start instruction; and terminal ID composed of own terminal ID, which is terminal identification information (terminal ID) for identifying an own device (the terminal device 20a), and the other terminal ID included in the session start instruction. The session start request is information of a request to start a session.

[0032]

The request reception part 41 of the server device 10 receives the session start request from the terminal device 20a. Upon reception of the session start request, the request reception part 41 generates session identification information (session ID) for identifying a session. Moreover, the request reception part 41 stores, into the session information storage part 42, session information including: the generated session ID; and the content ID and the terminal ID that are included in the session start request.

[0033]

In addition, the request reception part 41 transmits the generated session ID to each of the terminal devices 20a to 20c identified by the terminal ID included in the session start request.

[0034]

The request transmission part 31 of the terminal device 20a receives the session ID from the server device 10. Moreover, the request transmission part 31 accepts a session participation

instruction inputted by the user via the input device. The session participation instruction is information of an instruction to participate in a session.

[0035]

Upon acceptance of the session participation instruction, the request transmission part 31 transmits, to the server device 10, a session participation request including; the received session ID; the terminal identification information (the terminal ID) for identifying the own device (the terminal device 20a), i.e., the own terminal ID; an activation time; and a communication speed. The session participation request is information of a request to participate in a session.

[0036]

The activation time is a time required to activate an application program that the terminal device 20a executes for reproducing content. Moreover, the communication speed is the data amount of data transmitted from the server device 10 to the terminal device 20a per unit time. In this exemplary embodiment, the activation time and the communication speed are values inputted by the user. The terminal device 20a may be configured to measure the activation time and the communication speed and transmit a session participation request including the measured activation time and communication speed.

[0037]

The request reception part 41 of the server device 10 receives the session participation request from each of the terminal devices 20a to 20c. Upon reception of the session participation request, the request reception part 41 adds the activation time and communication speed included in the session participation request to the session information including the session ID and

terminal ID included in the session participation request, among the session information stored in the session information storage part 42.

[0038]

The content data storage part 44 of the server device 10 stores (accumulates) a plurality of content data in advance. Each of the content data is data representing one of a plurality of contents (e.g., information representing video and/or audio). The content data storage part 44 stores, as the content data representing the respective contents, a plurality of content data in each of which the content is coded with a code rate varying with the content. The code rate represents the data amount (the data size, e.g., the number of bytes) of content data for reproducing content at constant speed (reproducing content at 1x speed) for a unit time (e.g., one second).

[0039]

The reproduction start time setting part 43 of the server device 10 includes a reproduction start time determination part 43a and a reproduction start time transmission part 43b.

[0040]

The reproduction start time determination part 43a determines reproduction start time based on a session participation request received before a lapse of a preset standby time after reception of a session start request. The reproduction start time is time that a terminal device having transmitted the session participation request starts reproduction of content.

[0041]

To be specific, at a moment that the standby time elapses after reception of the session start request, the reproduction start time determination part 43a acquires session information

including session ID generated in response to the session start request, among the session information stored in the session information storage part 42.

[0042]

The reproduction start time determination part 43a calculates an each-device reproduction preparation time T_p for each of the acquired session information (i.e., each of the terminal devices). The each-device reproduction preparation time T_p is a time required for the terminal device to start reproduction of content.

[0043]

In this exemplary embodiment, the reproduction start time determination part 43a extracts content data representing content identified by content ID included in the acquired session information, from among the content data stored in the content storage part 44. Then, the reproduction start time determination part 43a specifies a code rate r having a value that is equal to or less than a communication speed included in the acquired session information and is the closest to the communication speed, from among the code rates of the extracted content data.

[0044]

Then, the reproduction start time determination part 43a calculates a reproduction preparation communication time T_c based on the specified code rate r, a communication speed B included in the acquired session, a preset target available reproduction time T_d, and an equation (1) shown below.

$$T_c = r \cdot T_d / B \qquad (1)$$

[0045]

The target available reproduction time T_d is a target value of an available reproduction

time. The target available reproduction time may be set for each terminal device. Alternatively, the target available reproduction time may be a value received from a terminal device. The available reproduction time is a time that a terminal device can reproduce content based on content data stored in the storage device (a buffer part 33 described later) of the terminal device. The reproduction preparation communication time T_c is a time required for the available reproduction time to coincide with the target available reproduction time T_d after the terminal device starts reception of the content data.

[0046]

Furthermore, the reproduction start time determination part 43a adds an activation time T_a included in the acquired session information and the calculated reproduction preparation communication time T_c, thereby calculating the each-device reproduction preparation time T_p as shown by an equation (2) below.

$$T_p = T_a + T_c \qquad (2)$$

[0047]

In addition, the reproduction start time determination part 43a adds a maximum value T_{pmax} of the calculated each-device reproduction preparation time T_p with present time t, thereby determining reproduction start time T_s as shown by an equation (3) below.

$$T_s = t + T_{pmax} \qquad (3)$$

[0048]

In a case that a session participation request is received after a lapse of the standby time from reception of a session start request, the reproduction start time determination part 43a determines reproduction start time T_s for a terminal device having transmitted the session

participation request in the same manner as described above.

[0049]

Upon determination of the reproduction start time, the reproduction start time determination part 43a adds the determined reproduction start time to the session information including the session ID and terminal ID included in the session participation request that is the basis of determination of the reproduction start time.

[0050]

The reproduction start time transmission part 43b transmits the reproduction start time determined by the reproduction start time determination part 43a to each terminal device having transmitted the session participation request.

Thus, the reproduction start time setting part 43 sets reproduction start time based on a target available reproduction time, an activation time, and a communication speed.

[0051]

The synchronous reproduction controlling part 32 of the terminal device 20a includes a reproduction start time reception part 32a. The reproduction start time reception part 32a receives reproduction start time transmitted from the server device 10. The synchronous reproduction controlling part 32 stores the reproduction start time received by the reproduction start time reception part 32a into the storage device. The synchronous reproduction controlling part 32 determines whether present time has reached the stored reproduction start time (it becomes the reproduction start time at this moment) every time a preset control period elapses.

[0052]

When the present time reaches the stored reproduction start time, the synchronous

reproduction controlling part 32 outputs a reproduction start instruction to the content reproducing part 33. The reproduction start instruction is information of an instruction to start reproduction of content. Thus, the synchronous reproduction controlling part 32 matches positions to reproduce content to be reproduced by the respective terminal devices 20a to 20c with each other among the terminal devices 20a to 20c.

[0053]

The content transmitting part 45 of the server device 10 transmits the content data stored in the content data storage part 44 to the terminal devices 20a to 20c. That is to say, the content transmitting part 45 transmits the content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the terminal devices 20a to 20c.

[0054]

To be specific, when the reproduction start time is determined by the reproduction start time setting part 43, the content transmitting part 45 transmits the content data stored in the content data storage part 44 to the terminal device having transmitted the session participation request that is the basis of determination of the reproduction start time.

[0055]

At this moment, the content transmitting part 45 transmits content data that is identified by the content ID included in the session information including the session ID included in the session participation request and is coded with a code rate specified by the reproduction start time determination part 43a for the terminal device having transmitted the session participation request.

[0056]

In the case of transmitting the content data based on the session participation request received before the standby time elapses after reception of the session start request, the content transmitting part 45 starts transmission of the content data with the head position.

[0057]

On the other hand, in the case of transmitting the content data based on the session participation request received after a lapse of the standby time from reception of the session start request, the content transmitting part 45 determines whether a determination condition is satisfied or not. Herein, the determination condition is a condition that reproduction start time determined by the reproduction start time setting part 43 based on the session participation request (second reproduction start time) is later time than reproduction start time determined by the reproduction start time setting part 43 based on another session participation request including the same session ID as the session participation request (first reproduction start time).

[0058]

In a case that the second reproduction start time is time before the first reproduction start time, the content transmitting part 45 starts transmission of the content data from the head position.

[0059]

On the other hand, in a case that the second reproduction start time is time after the first reproduction start time, the content transmitting part 45 determines a position behind the head position by a difference between the first reproduction start time and the second reproduction start time, as a transmission start position. The transmission start position is in content data, which is a position to start transmission of the content data. Then, the content transmitting part

45 starts transmission of the content data from the determined transmission start position.

[0060]

That is to say, in a case that reproduction start time set for a second terminal device (second reproduction start time) is later time than reproduction start time set for a first terminal device (first start reproduction start time), the content transmitting part 45 estimates a content reproduction position (i.e., a transmission start position) that the first terminal device is reproducing at the second reproduction start time. Then, the content transmitting part 45 transmits a portion of the content data after the estimated reproduction position, to the second terminal device.

[0061]

The content reproducing part 33 of the terminal device 20a includes a content reception part 33a, a buffer part 33b, and a content reproduction execution part 33c.

The content reception part 33a receives content data transmitted by the server device 10. The buffer part 33b stores data received by the content reception part 33a. The content reproduction execution part 33c reproduces content based on the data stored by the buffer part 33b.

[0062]

That is to say, the content reproducing part 33, while receiving content data transmitted by the server device 10, stores received data of the content data into the storage device and reproduces content based on the stored data (performs streaming reproduction).

[0063]

In the case of accepting a reproduction start instruction outputted by the synchronous

reproduction controlling part 32 (i.e., at set reproduction start time), the content reproduction execution part 33c starts reproduction of content.

[0064]

The available reproduction time transmission part 34 of the terminal device 20a acquires an available reproduction time, which is a time that the content reproduction execution part 33c can reproduce the content based on the content data stored by the buffer part 33b, every time an acquisition period (a change period) set in advance elapses. Upon acquisition of the available reproduction time, the available reproduction time transmission part 34 transmits available reproduction time information, which includes the acquired available reproduction time, the own terminal ID (the terminal ID) and the session ID, to the server device 10.

[0065]

The available reproduction time reception part 46 of the server device 10 receives available reproduction time information from the respective terminal devices 20a to 20c.

When the available reproduction time information is received by the available reproduction time reception part 46, the code rate determining part 47 of the server device 10 acquires the reproduction start time included in the session information including the terminal ID and session ID included in the available reproduction time information.

[0066]

The code rate determining part 47 determines a code rate for the terminal device having transmitted the available reproduction time information, based on a remaining time before the acquired (i.e., set) reproduction start time from the present moment and the available reproduction time included in the available reproduction time information.

[0067]

To be specific, the code rate determining part 47 determines, as the code rate, a value that becomes smaller as the available reproduction time becomes shorter than the target available reproduction time and that becomes smaller as the remaining time becomes shorter.

[0068]

In this exemplary embodiment, the code rate determining part 47 calculates (acquires) a communication speed B_n during a period between the present moment and a moment that is the change period before (past), based on an equation (4) shown below, wherein n denotes an integer and represents the number of times of reception of the available reproduction time information from the terminal device.

$$B_n = (T_n - T_{n-1}) \cdot r_n / (t_n - t_{n-1}) \quad (4)$$

[0069]

In the equation, t_n denotes time of reception of the available reproduction time information this time (i.e., time at the present moment), and t_{n-1} denotes time of reception of the available reproduction time information last time (i.e., time at a moment that is the change period before). Moreover, T_n denotes the available reproduction time received this time (i.e., at the present moment), and T_{n-1} denotes the available reproduction time received last time (i.e., at a moment that is the change period before). Moreover, r_n denotes a code rate of content data transmitted during a period between the time t_{n-1} to the time t_n.

[0070]

In this exemplary embodiment, assuming a communication speed is kept at the communication speed B_n during a period between the present moment and the reproduction start

time, the code rate determining part 47 determines a code rate r_{n+1} of content data to be transmitted by time of the available reproduction time information next time (i.e., time at a moment that is the change period after). That is to say, the code rate determining part 47 determines the code rate r_{n+1} based on an equation (5) shown below.

$$r_{n+1} = B_n \cdot (t_s - t_n) / (T_d - T_n) \quad (5)$$

[0071]

That is to say, the code rate determining part 47 determines, as the code rate r_{n+1}, a result of dividing a result of multiplying the acquired communication speed B_n and a remaining time t_s-t_n by a result T_d-T_n of subtracting the available reproduction time T_n from the target available reproduction time T_d.

[0072]

When the code rate r_{n+1} is determined by the code rate determining part 47, the content transmitting part 45 changes content data to be transmitted to the terminal device having transmitted the available reproduction time information having been the basis of determination of the code rate r_{n+1}, to content data coded with the code rate r_{n+1}. That is to say, the content transmitting part 45 changes the code rate of the content data to be transmitted to the terminal device having transmitted the available reproduction time information, to the code rate determined based on the available reproduction time information.

[0073]

In a case that content data of the code rate r_{n+1} determined by the code rate determining part 47 is not stored by the content data storage part 44, the content transmitting part 45 transmits content data having a code rate that is equal to or less than the code rate r_{n+1} and is the closest to

the code rate r_{n+1}, among the content data stored by the content storage part 44.

[0074]

Next, an operation of the abovementioned distribution system 1 will be described. In this exemplary embodiment, the server device 10 stores, for each content, content data respectively coded with 2Mbps, 4Mbps, 16Mbps and 50Mbps into the storage device in advance. Moreover, the target available reproduction time T_d is set to 30 seconds.

[0075]

As shown in Fig. 3, the terminal device 20a accepts a session start instruction including "C01" as content ID, and "R02" and "R03" as other terminal ID. In this exemplary embodiment, "R01" denotes terminal ID for identifying the terminal device 20a, "R02" denotes terminal ID for identifying the terminal device 20b, and "R03" denotes terminal ID for identifying the terminal device 20c.

[0076]

Upon acceptance of the session start instruction, the terminal device 20a transmits a session start request including "C01" as content ID, and "R01," "R02," and "R03" as other terminal ID to the server device 10 (step S101).

[0077]

Upon reception of the session start request from the terminal device 20a, the server device 10 executes a transmission control program shown by a flowchart in Fig. 4. The server device 10 generates "S01" as session ID for identifying a session. Moreover, the server device 10 stores session information including the generated session ID "S01" and the content ID "C01" and terminal ID ("R01", "R02," and "R03") included in the session start request, into the storage

device as shown in Fig. 5.

[0078]

In addition, the server 10 transmits the generated session ID to each of the terminal devices 20a to 20c identified by the terminal ID included in the session start request (step S102 of Fig. 4, step S102 of Fig. 3). After that, the server device 10 waists for the standby time (in this exemplary embodiment, three seconds) (step S202 of Fig. 4).

[0079]

Next, when the user of the terminal device 20a inputs a session participation instruction, the terminal device 20a executes a reproduction start control program shown by a flowchart in Fig. 6. The terminal device 20a transmits, to the server device 10, a session participation request including the received session ID "S01," the terminal ID "R01," an activation time "1200" (ms), and a communication speed "3" (Mbps) (step S301 of Fig. 6, step S103 of Fig. 3).

[0080]

In this exemplary embodiment, like the terminal device 20a, the terminal device 20b also transmits, to the server device 10, a session participation request including the session ID "S01," the terminal ID "R02," an activation time "1000," (ms) and a communication speed "50" (Mbps) (step S104 of Fig. 3).

[0081]

Upon reception of the session participation request from each of the terminal devices 20a and 20b, the server device 10 adds the activation time and communication speed included in the session participation request to the session information including the session ID and terminal ID included in the session participation request among the session information stored in the

storage device, as shown in Fig. 7.

[0082]

Then, after a lapse of the standby time, the server device 10 specifies, for each of the terminal devices 20a and 20b having transmitted the session participation requests, a code rate r that is equal to or less than the communication speed and is the closest to the communication speed, from among the code rates of the content data stored in the storage device. In this exemplary embodiment, the server device 10 specifies "2Mbps" as the code rate r for the terminal device 20a, and specifies "50Mbps" as the code rate r for the terminal device 20b.

[0083]

Next, for each of the terminal devices 20a and 20b having transmitted the session participation requests, the server device 10 calculates each-device reproduction preparation time T_p, based on the communication speed B and activation time T_a included in the stored session information and the preset target available reproduction time T_d (step S203 of Fig. 4).

[0084]

In this exemplary embodiment, the server device 10 acquires "21.2" as the each-device reproduction preparation time T_p for the terminal device 20a and acquires "31" as the each-device reproduction preparation time T_p for the terminal device 20b, based on the equations (1) to (3) shown above.

[0085]

Next, the server device 10 determines reproduction start time T_s ("13:01:34") based on a maximum value T_{pmax} (herein, "31") of the calculated each-device reproduction preparation times T_p (step S204 of Fig. 4). Then, the server device 10 adds the determined reproduction start

time to the session information including the session ID "S01" and the terminal ID "R01" and the session information including the session ID "S01" and the terminal ID "R02," respectively, as shown in Fig. 8.

[0086]

Next, the server device 10 transmits the determined reproduction start time T_s to each of the terminal devices 20a and 20b having transmitted the session participation requests (step S205 of Fig. 4, step S105 of Fig. 3).

[0087]

Thus, the terminal device 20a receives the reproduction start time T_s from the server device 10 (step S302 of Fig. 6). The terminal device 20b also operates like the terminal device 20a after that.

[0088]

Then, the server device 10 determines whether the determined reproduction start time T_s is time after reproduction start time determined based on another session participation request including the same session ID as the received session participation request (step S206 of Fig. 4).

[0089]

At this moment, the server device 10 has not received another session participation request including the same session ID as the received session participation request. Therefore, the server device 10 determines "No" and proceeds to step S208 to start transmission of content data to each of the terminal devices 20a and 20b having transmitted the session participation requests from the head position of the content data (step S208 of Fig. 4, step S106 of Fig. 3).

[0090]

At this moment, the content data that the server device 10 transmits to the terminal device 20a is content data representing content identified by the content ID "C01" included in the session information including the session ID "S01." Moreover, this content data is data coded with the code rate specified based on the communication speed included in the session participation request received from the terminal device 20a.

[0091]

Likewise, the content data that the server device 10 transmits to the terminal device 20b is content data representing content identified by the content ID "C01" included in the session information including the session ID "S01." Moreover, this content data is data coded with the code rate specified based on the communication speed included in the session participation request received from the terminal device 20b.

[0092]

Further, the server device 10 stores history information that associates the session ID and terminal ID included in the session participation request, "0" as the initial value of an available reproduction time, and a difference "31" between the reproduction start time and the present time into the storage device as shown in Fig. 9.

[0093]

On the other hand, the terminal device 20a starts reception of the content data transmitted by the server device 10 (step S303 of Fig. 6). Next, the terminal device 20a determines whether the present time has reached the reproduction start time T_s (step S304 of Fig. 6). At this moment, the present time has not reached the reproduction start time T_s.

[0094]

Therefore, the terminal device 20a determines "No" and proceeds to step S305 to determine whether a transmission period (in this exemplary embodiment, five seconds) has elapsed after start of reception of the content data (step S305 of Fig. 6). At this moment, the transmission period has not elapsed after start of reception of the content data.

[0095]

Therefore, the terminal device 20a determines "No" and returns to step S304 to repeatedly execute the abovementioned process until the transmission period elapses after start of reception of the content data.

[0096]

Then, after a lapse of the transmission period from start of reception of the content data, the terminal device 20a determines "Yes" at step S305 and proceeds to step S306 to acquire an available reproduction time. Herein, it is assumed that the acquired available reproduction time is "7" seconds.

[0097]

Then, the terminal device 20a transmits available reproduction time information including the acquired available reproduction time "7," the terminal ID "R01," and the session ID "S01" to the server device 10 (step S107 of Fig. 3). Likewise, the terminal device 20b transmits available reproduction time information including the acquired available reproduction time "2," the terminal ID "R02," and the session ID "S01" to the server device 10 (step S108 of Fig. 3).

[0098]

On the other hand, the server device 10 proceeds to step S209 of Fig. 4 and, in order to

perform a code rate change control on each of the terminal devices, executes a code rate change control program shown by a flowchart in Fig. 10 independently on each of the terminal devices 20a and 20b having been transmitting the content data.

[0099]

First, a code rate change control that the server device 10 executes on the terminal device 20a will be described.

[0100]

The server device 10 determines whether the present time has reached the reproduction start time T_s (step S401 of Fig. 10). At this moment, the present time has not reached the reproduction start time T_s.

[0101]

Therefore, the server device 10 determines "No" and proceeds to step S402 to determine whether the server device 10 has received available reproduction time information from the terminal device 20a. In a case that the server device 10 has not received available reproduction time information from the terminal device 20a, the server device 10 returns to step S401 to repeatedly execute the abovementioned process.

[0102]

The server device 10 is receiving available reproduction time information from the terminal device 20a now. Therefore, the server device 10 determines "Yes" and proceeds to step S403 to, as shown in Fig. 11, store history information that associates the session ID "S01," terminal ID "R01" and available reproduction time "7" included in the available reproduction time information with a difference "26" between the reproduction start time and the present time,

into the storage device.

[0103]

The server device 10 determines a code rate based on the history information stored in the storage device. In this exemplary embodiment, the server device 10 acquires "2.8 Mbps" as the communication speed B_n based on the equation (4) shown above. Moreover, the server device 10 acquires (determines) "3.165 Mbps" as the code rate r_{n+1} based on the equation (5) shown above (step S403 of Fig. 10).

[0104]

Then, the server device 10 specifies "2 Mbps" as a code rate that is equal to or less than the code rate r_{n+1} and is the closest to the code rate r_{n+1} from among the code rates of the content data stored in the storage device. Next, the server device 10 changes the code rate of the content data being transmitted to the terminal device 20a, to the specified code rate "2 Mbps" (step S404 of Fig. 10). After that, the server device 10 returns to step S401 to repeatedly execute the process described above.

[0105]

Next, a code rate change control that the server device 10 executes on the terminal device 20b will be described.

[0106]

Upon reception of available reproduction time information from the terminal device 20b, the server device 10 proceeds to step S403 of Fig. 10 and, as shown in Fig. 11, stores history information that associates the session ID "S01," terminal ID "R02" and available reproduction time "2" included in the available reproduction time information with a difference "26" between

the reproduction start time and the present time, into the storage device.

[0107]

The server device 10 determines a code rate based on the history information stored in the storage device. In this exemplary embodiment, the server device 10 acquires "20 Mbps" as the communication speed B_n based on the equation (4) shown above. Moreover, the server device 10 acquires (determines) "18.57 Mbps" as the code rate r_{n+1} based on the equation (5) described above (step S403 of Fig. 10).

[0108]

Then, the server device 10 specifies "16 Mbps" as a code rate that is equal to or less than the code rate r_{n+1} and is the closest to the code rate r_{n+1} from among the code rates of the content data stored in the storage device. Next, the server device 10 changes the code rate of the content data being transmitted to the terminal device 20b, to the specified code rate "16 Mbps" (step S404 of Fig. 10). After that, the server device 10 returns to step S401 to repeatedly execute the process described above.

[0109]

Then, when the transmission period elapses again after transmission of the available reproduction time information by the terminal device 20a and the terminal device 20b, the terminal device 20a and the terminal device 20b respectively determine "Yes" at step S305 of Fig. 6 and proceed to step S306 to transmit available reproduction time information to the server device 10.

[0110]

It is assumed that the terminal device 20a transmits available reproduction time

information including an available reproduction time "18," terminal ID "R01" and session ID "S01" to the server device 10 and the terminal device 20b transmits available reproduction time information including an available reproduction time "14," terminal ID "R02" and session ID "S01" to the server device 10.

[0111]

First, a code rate change control that the server device 10 executes on the terminal device 20a will be described.

[0112]

The server device 10 determines "Yes" at step S402 of Fig. 10 and proceeds to step S403 to, as shown in Fig. 12, store history information that associates the session ID "S01," terminal ID "R01" and available reproduction time "18" included in the available reproduction time information with a difference "21" between the reproduction start time and the present time, into the storage device.

[0113]

The server device 10 determines a code rate based on the history information stored in the storage device. In this exemplary embodiment, the server device 10 acquires "4.4 Mbps" as the communication speed B_n based on the equation (4) shown above. Moreover, the server device 10 acquires (determines) "7.7 Mbps" as the code rate r_{n+1} based on the equation (5) shown above (step S403 of Fig. 10).

[0114]

Then, the server device 10 specifies "4 Mbps" as a code rate that is equal to or less than the code rate r_{n+1} and is the closest to the code rate r_{n+1} from among the code rates of the content

data stored in the storage device. Next, the server device 10 changes the code rate of the content data being transmitted to the terminal device 20a, to the specified code rate "4 Mbps" (step S404 of Fig. 10). After that, the server device 10 returns to step S401 to repeatedly execute the process described above.

[0115]

Next, a code rate change control that the server device 10 executes on the terminal device 20b will be described.

[0116]

The server device 10 determines "Yes" at step S402 of Fig. 10 and proceeds to step S403 to, as shown in Fig. 12, store history information that associates the session ID "S01," terminal ID "R02" and available reproduction time "14" included in the available reproduction time information with a difference "21" between reproduction start time and present time into the storage device.

[0117]

The server device 10 determines a code rate based on the history information stored in the storage device. In this exemplary embodiment, the server device 10 acquires "38.4 Mbps" as the communication speed B_n based on the equation (4) shown above. Moreover, the server device 10 acquires (determines) "50.4 Mbps" as the code rate r_{n+1} based on the equation (5) shown above (step S403 of Fig. 10).

[0118]

Then, the server device 10 specifies "50 Mbps" as a code rate that is equal to or less than the code rate r_{n+1} and is the closest to the code rate r_{n+1} from among the code rates of the

content data stored in the storage device. Next, the server device 10 changes the code rate of the content data being transmitted to the terminal device 20a, to the specified code rate "50 Mbps" (step S404 of Fig. 10). After that, the server device 10 returns to step S401 to repeatedly execute the abovementioned process.

[0119]

After that, every time the transmission period (the change period) elapses, the server device 10 determines a code rate for each of the terminal devices 20a and 20b transmitting the content data, and changes the code rate of the content data being transmitted to the determined code rate.

[0120]

After that, when the present time reaches the reproduction start time T_s, the terminal device 20a and the terminal device 20b each determine "Yes" at step S304 of Fig. 6 and proceeds to step S307 to start reproduction of content (output of content to the output device) based on the content data stored in the storage device (steps S110a and S110b of Fig. 3).

[0121]

Thus, it is possible to securely match the positions to reproduce the content with each other between the plurality of terminal devices 20a and 20b. That is to say, it is possible to cause the plurality of terminal devices 20a and 20b to reproduce the same content synchronously with each other.

[0122]

Further, at this moment, the server device 10 determines "Yes" at step S401 of Fig. 10 and ends execution of the code rate change control program.

[0123]

Thus, the distribution system 1 changes each of the code rates of the content data transmitted from the server device 10 to the terminal devices 20a and 20b based on both the remaining time and the available reproduction time. Consequently, in a case that the available reproduction time is relatively short and the remaining time is considerably long, the distribution system 1 can set the code rate to a relatively large value. As a result, it is possible to avoid meaninglessly lowering the code rate.

[0124]

Further, in a case that the available reproduction time is relatively long and the remaining time is considerably short, the distribution system 1 can set the code rate to a relatively small value. As a result, it is possible to secure a sufficiently long available reproduction time at the reproduction start time. Therefore, the terminal devices 20a and 20b can each securely start reproduction of the content at the set reproduction start time.

[0125]

Thus, according to the distribution system 1, it is possible to cause each of the terminal devices 20a and 20b to securely start reproduction of the content at the set reproduction start time while avoiding meaninglessly lowering the code rate.

[0126]

Furthermore, the distribution system 1 is configured to determine, as a code rate, a value that becomes smaller as the available reproduction time becomes smaller than the target available reproduction time and that becomes smaller as the remaining time becomes shorter.

Thus, it is possible to make the available reproduction time at the reproduction start time

sufficiently close to the target available reproduction time. As a result, it is possible to cause each of the terminal devices 20a and 20b to securely start reproduction of the content at the set reproduction start time while avoiding meaninglessly lowering the code rate.

[0127]

In addition, the distribution system 1 is configured to acquire a communication speed, which is the data amount of content data transmitted from the server device 10 to each of the terminal devices 20a and 20b per unit time, and determine the result of dividing the result of multiplying the acquired communication speed and the remaining time by the result of subtracting the available reproduction time from the target available reproduction time, as a code rate.

Thus, it is possible to make the available reproduction time at the reproduction start time close to the target available reproduction time with more security.

[0128]

Furthermore, the distribution system 1 is configured to set a reproduction start time based on a target available reproduction time, which is a target value of an available reproduction time.

Thus, it is possible to make an available reproduction time at reproduction start time close to a target available reproduction time with security.

[0129]

In addition, the distribution system 1 is configured to, for each of the plurality of terminal devices 20a and 20b, calculate an each-device reproduction preparation time, which is a time required for the terminal device to start reproduction of content, and set reproduction start

time based on the maximum value of the calculated each-device reproduction preparation time.

[0130]

Consequently, all of the plurality of terminal devices 20a and 20b can securely make a target available reproduction time close to an available reproduction time before reproduction start time. As a result, it is possible to securely match the positions to reproduce content with each other between the plurality of terminal devices 20a and 20b.

[0131]

Furthermore, the distribution system 1 is configured to set reproduction start time based on an activation time, which is a time required for activation of an application program that the terminal devices 20a and 20b each execute to reproduce content, and a target available reproduction time.

Thus, the terminal devices 20a and 20b can each securely start reproduction of content at the reproducible start time.

[0132]

In addition, the distribution system 1 is configured to set reproduction start time based on a communication speed, which is the data amount of content data transmitted from the server device 10 to each of the terminal devices 20a and 20b per unit time, and a target available reproduction time.

Thus, it is possible to properly set the reproduction start time.

[0133]

Assuming, in a state that the terminal devices 20a and 20b reproduce the same content synchronously with each other, the user of the terminal device 20c wants the terminal device 20c

to reproduce the content synchronously with the terminal devices 20a and 20b, the description will be continued.

[0134]

In this case, the user of the terminal device 20c inputs a session participation instruction. Consequently, the terminal device 20c transmits a session participation request including the session ID "S01," terminal ID "R03," activation time "1500" (ms) and communication speed "8" (Mbps) having been received to the server device 10 (step S301 of Fig. 6, step S501 of Fig. 13).

[0135]

Upon reception of the session participation request from the terminal device 20c, the server device 10 adds the activation time and communication speed included in the session participation request to session information including the session ID and terminal ID included in the session participation request among the session information stored in the storage device as shown in Fig. 14.

[0136]

Then, for the terminal device 20c having transmitted the session participation request, the server device 10 specifies a code rate r that is equal to or less than the communication speed and is the closest to the communication speed from among the code rates of the content data stored in the storage device. In this exemplary embodiment, the server device 10 specifies "4 Mbps" as the code rate r for the terminal device 20c.

[0137]

Next, for the terminal device 20c having transmitted the session participation request, the server device 10 calculates the each-device reproduction preparation time T_p based on the

communication speed B and activation time T_a included in the stored session information and the target available reproduction time T_d set in advance (step S203 of Fig. 4).

[0138]

Next, the server device 10 determines the reproduction start time T_s ("13:05:25") based on the calculated each-device reproduction preparation time T_p (step S204 of Fig. 4). Then, as shown in Fig. 15, the server device 10 adds the determined reproduction start time to the session information including the session ID "S01" and the terminal ID "R03."

[0139]

Next, the server device 10 transmits the determined reproduction start time T_s to the terminal device 20c having transmitted the session participation request (step S205 of Fig. 4, step S502 of Fig. 13). Thus, the terminal device 20c receives the reproduction start time T_s from the server device 10 (step S302 of Fig. 6).

[0140]

Then, the server device 10 determines whether the determined reproduction start time T_s is time later than reproduction start time determined based on another session participation request including the same session ID as that of the received session participation request (step S206 of Fig. 4).

[0141]

At this moment, reproduction start time (second reproduction start time) determined based on the session participation request received from the terminal device 20c (a second reception device) is time later than reproduction start time (first reproduction start time) determined based on the session participation requests received from the terminal device 20a (a

first reception device) and the terminal device 20b. Moreover, the session participation requests received from the terminal devices 20a and 20b include the same session ID as the session ID included in the session participation request received from the terminal device 20c. That is to say, the determined reproduction start time T_s is time later than reproduction start time determined based on another session participation request including the same session ID as the received session participation request.

[0142]

Therefore, the server device 10 determines "Yes" and proceeds to step S207 to determine a position behind a head position by a difference between the first reproduction start time and the second reproduction start time, as a transmission start position. Then, the server device 10 proceeds to step S208 and starts transmission of content data from the determined transmission start position to the terminal device 20c (step S503 of Fig. 13).

[0143]

At this moment, content data transmitted by the server device 10 to the terminal device 20c is content data representing content identified by the content ID "C01" included in the session information including the session ID "S01." Moreover, this content data is data coded with a code rate specified based on a communication speed included in the session participation request received from the terminal device 20c.

[0144]

As in the abovementioned case, the terminal device 20c transmits available reproduction time information including an available reproduction time to the server device 10 every time a transmission period elapses (step S504 of Fig. 13).

Then, the server device 10 performs a code rate change control on the terminal device 20c every time receiving available reproduction time information from the terminal device 20c (step S505 of Fig. 13).

[0145]

After that, when the present time reaches the reproduction start time received from the server device 10, the terminal device 20c starts reproduction of content based on the content data stored in the storage device (step S506 of Fig. 13).

[0146]

Consequently, it is possible to securely match the positions to reproduce content with each other among the plurality of terminal devices 20a to 20c. That is to say, it is possible to cause the plurality of terminal devices 20a to 20c to reproduce the same content synchronously with each other.

[0147]

As described above, the distribution system 1 according to the first exemplary embodiment of the present invention makes it possible to cause the terminal devices 20a to 20c to securely start reproduction of content at set reproduction start time while avoiding meaninglessly lowering a code rate.

[0148]

The distribution system 1 according to the first exemplary embodiment is configured so that the server device 10 determines a code rate based on a remaining time and an available reproduction time, but may be configured so that each of the terminal devices 20a to 20c determines a code rate based on a remaining time and an available reproduction time. In this case,

each of the terminal devices 20a to 20c is configured to transmit the determined code rate to the server device 10

[0149]

Further, the distribution system 1 according to the first exemplary embodiment is configured to match the positions to reproduce content to be reproduced by the respective terminal devices 20a to 20c with each other among the terminal devices 20a to 20c, but the positions to reproduce content to be reproduced by the respective terminal devices 20a to 20c may be different from each other.

[0150]

Further, the distribution system 1 according to the first exemplary embodiment may be configured so that content data are transmitted and received among the terminal devices.

Further, the number of the terminal devices included by the distribution system 1 according to the first exemplary embodiment is three, but may be two, four, or more.

[0151]

Each of the functions of the distribution system 1 in the first exemplary embodiment is realized by execution of a program (software) by the CPU, but may be realized by hardware such as a circuit.

[0152]

<Second Exemplary Embodiment>

Next, a communication system according to a second exemplary embodiment of the present invention will be described with reference to Fig. 16.

A distribution system 100 according to the second exemplary embodiment is a system

including a transmission device 110 and a reception device 120 configured to be capable of communicating with each other.

[0153]

The transmission device 110 is equipped with a content transmitting part (a content transmitting means) 111 for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device 120.

The reception device 120 is equipped with a content reproducing part (a content reproducing means) 121 for, while receiving the content data transmitted by the transmission device 110, storing received data of the content data into a storage device and also reproducing the content based on the stored data.

[0154]

The distribution system 100 comprises a code rate determining part (a code rate determining means) 131 for determining the code rate based on a remaining time before reproduction start time set as time at which the reception device 120 starts reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device 120.

[0155]

The content transmitting part 111 is configured to change the code rate of the content data to be transmitted to the reception device 120 to the determined code rate.

The content reproducing means 121 is configured to start reproduction of the content at the set reproduction start time.

[0156]

Accordingly, the distribution system 100 changes a code rate of content data transmitted from the transmission device 110 to the reception device 120 based on both a remaining time and an available reproduction time. Consequently, the distribution system 100 can set the code rate to a relatively large value in a case that the available reproduction time is relatively short and the remaining time is considerably long. As a result, it is possible to avoid meaninglessly lowering the code rate.

[0157]

Further, the distribution system 100 can set the code rate to a relatively small value in a case that the available reproduction time is relatively long and the remaining time is considerably short. As a result, it is possible to secure a sufficiently large available reproduction time at reproduction start time. Therefore, the reception device 120 can securely start reproduction of content at the set reproduction start time.

[0158]

Thus, according to the distribution system 100, it is possible to cause the reception device 120 to securely start reproduction of the content at the set reproduction start time while avoiding meaninglessly lowering the code rate.

[0159]

In this case, it is preferred that the code rate determining means is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

[0160]

Accordingly, it is possible to make the available reproduction time at the reproduction start time close to a target available reproduction time with sufficiency. As a result, it is possible to cause the reception device to securely start reproduction of the content at the set reproduction start time while avoiding meaninglessly lowering the code rate.

[0161]

In this case, it is preferred that the code rate determining means is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

[0162]

The degree of increase of the available reproduction time varies with a communication speed. Therefore, by configuring the distribution system as described above, it is possible to more securely make the available reproduction time at the reproduction start time close to the target available reproduction time.

[0163]

In this case, it is preferred that the code rate determining means is configured to determine the code rate with every change period set in advance.

[0164]

In this case, it is preferred that the distribution system includes a plurality of the

reception devices and comprises a synchronous reproduction controlling means for matching reproduction positions of the content to be reproduced by the plurality of the reception devices, respectively, with each other among the plurality of the reception devices.

[0165]

Accordingly, it is possible to securely match positions to reproduce the content with each other among a plurality of reception devices.

[0166]

In this case, it is preferred that the distribution system comprises a reproduction start time setting means for setting the reproduction start time based on a target available reproduction time, which is a target value of the available reproduction time.

[0167]

As the target available reproduction time increases, a time required for the available reproduction time to coincide with the target available reproduction time increases. Therefore, as in the configuration described above, by setting the reproduction start time based on the target available reproduction time, it is possible to securely make the available reproduction time at the reproduction start time close to the target available reproduction time.

[0168]

In this case, it is preferred that the content transmitting means is configured to, when second reproduction start time, which is reproduction start time set for a second reception device as one of the plurality of the reception devices, is later than first reproduction start time, which is reproduction start time set for a first reception device as another one of the plurality of the reception devices, estimate a reproduction position of the content being reproduced by the first

reception device at the second reproduction start time and transmit a portion of the content data at and after the estimated reproduction position to the second reception device.

[0169]

In this case, it is preferred that the reproduction start time setting means is configured to, for each reception device of the plurality of the reception devices, calculate an each-device reproduction preparation time as a time required for the reception device to start reproduction of the content and set the reproduction start time based on a maximum value of the calculated each-device reproduction preparation time.

[0170]

Reception speeds often vary with reception devices. Therefore, by configuring the distribution system as described above, all of the reception devices can securely make the available reproduction times close to the target available reproduction times. As a result, it is possible to securely match positions to reproduce the content with each other among the reception devices.

[0171]

In this case, it is preferred that the reproduction start time setting means is configured to set the reproduction start time based on an activation time, which is a time required for activation of an application program to be executed by the reception device for reproduction of the content, and the target available reproduction time.

[0172]

A time required for the reception device to start reproduction of the content includes an activation time and a time required for the available reproduction time to reach the target

available reproduction time. Therefore, by configuring the distribution system as described above, it is possible to cause the reception device to securely start reproduction of the content at the reproduction start time.

[0173]

In this case, it is preferred that the reproduction start time setting means is configured to set the reproduction start time based on a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time, and the target available reproduction time.

[0174]

The time required for the available reproduction time to reach the target available reproduction time varies with the communication speed. Therefore, by configuring the distribution system as described above, it is possible to properly set the reproduction start time.

[0175]

Further, a distribution method of another exemplary embodiment of the present invention is a method that is applied to a distribution system including a transmission device and a reception device configured to be capable of communicating with each other and that comprises:

transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device, by the transmission device;

while receiving the content data transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the

stored data, by the reception device;

determining the code rate based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device;

changing the code rate of the content data to be transmitted to the reception device to the determined code rate, by the transmission device; and

starting reproduction of the content at the set reproduction start time, by the reception device.

[0176]

In this case, it is preferred that the distribution method comprises determining a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

[0177]

In this case, it is preferred that the distribution method comprises:

acquiring a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time; and

determining a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

[0178]

In this case, it is preferred that the distribution method comprises determining the code rate with every change period set in advance.

[0179]

In this case, it is preferred that the distribution method is applied to the distribution system including a plurality of the reception devices and comprises matching reproduction positions of the content to be reproduced by the plurality of the reception devices, respectively, with each other among the plurality of the reception devices.

[0180]

Further, a transmission device of another exemplary embodiment of the present invention is a device configured to be capable of communicating with a reception device.

The transmission device comprises a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device.

The content transmitting means is configured to change the code rate of the content data to be transmitted to the reception device to a code rate determined based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

[0181]

In this case, it is preferred that the transmission device comprises a code rate determining means for determining the code rate based on the remaining time and the available

reproduction time.

[0182]

In this case, it is preferred the code rate determining means is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

[0183]

In this case, it is preferred that the code rate determining means is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

[0184]

In this case, it is preferred that the code rate determining means is configured to determine the code rate with every change period set in advance.

[0185]

Further, a program of another exemplary embodiment of the present invention comprises instructions for causing a transmission device configured to be capable of communicating with a reception device to realize a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device.

The content transmitting means is configured to change the code rate of the content data to be transmitted to the reception device to a code rate determined based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

[0186]

Further, a reception device of another exemplary embodiment of the present invention is a device configured to be capable of communicating with a transmission device.

The reception device comprises:

a content reproducing means for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means for determining the code rate based on a remaining time before reproduction start time set as time to start reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device.

The content reproducing means is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

[0187]

In this case, it is preferred that the code rate determining means is configured to

determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

[0188]

In this case, it is preferred that the code rate determining means is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

[0189]

In this case, it is preferred that the code rate determining means is configured to determine the code rate with every change period set in advance.

[0190]

A program of another exemplary embodiment of the present invention comprises instructions for causing a reception device configured to be capable of communicating with a transmission device to realize:

a content reproducing means for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means for determining the code rate based on a remaining time

before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device

The content reproducing means is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

[0191]

Inventions of a distribution method, a transmission device, a program and a reception device having the aforementioned configurations have the same actions as the distribution system described above, and therefore, can achieve the object of the present invention mentioned above.

[0192]

[0193]

Further, the program is stored in the storage device in the respective exemplary embodiments, but may be stored in a computer-readable storage medium. For example, the recording medium is a portable medium such as a flexible disk, an optical disk, a magneto-optical disk and a semiconductor memory.

[0194]

Further, as modified examples of the exemplary embodiments, any combination of the exemplary embodiments and modified examples may be employed.

[0195]

The present invention is based upon and claims the benefit of priority from Japanese patent application No. 2009-253581, filed on November 5, 2009.

INDUSTRIAL APPLICABILITY

[0196]

The present invention can be applied to, for example, a distribution system that transmits content data representing content from a transmission device to a reception device.

DESCRIPTION OF REFERENCE NUMERALS

[0197]

1 distribution system

10 server device

20a, 20b, 20c terminal device

31 request transmission part

32 synchronous reproduction controlling part

32a reproduction start time reception part

33 content reproducing part

33a content reception part

33b buffer part

33c content reproduction execution part

34 available reproduction time transmission part

41 request reception part

42 session information storage part

43 reproduction start time setting part

43a reproduction start time determination part

43b reproduction start time transmission part

44 content data storage part

45 content transmitting part

46 available reproduction time reception part

47 code rate determining part

100 distribution system

110 transmission device

111 content transmitting part

120 reception device

121 content reproducing part

131 code rate determining part

NW communication line

EP 10 828 052.0
NBA 038 WO/EP
February, 2016

NEW CLAIMS

1. A distribution system (100), including a transmission device (110) and a reception device (120) configured to be capable of communicating with each other,

the transmission device (110) being equipped with a content transmitting means (111) for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device (120), and

the reception device (120) being equipped with a content reproducing means (121) for, while receiving the content data transmitted by the transmission device (110), storing received data of the content data into a storage device and also reproducing the content based on the stored data,

the distribution system, comprising a code rate determining means (131) for determining the code rate based on a remaining time before reproduction start time set for the reception device (120) as time at which the reception device (120) starts reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120), wherein:

the content transmitting means (111) is configured to change the code rate of the content data to be transmitted to the reception device (120) to the determined code rate; and

the content reproducing means (121) is configured to start reproduction of the content at the set reproduction start time.

2. The distribution system according to Claim 1, wherein the code rate determining means (131) is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

3. The distribution system according to Claim 2, wherein the code rate determining means (131) is configured to acquire a communication speed, which is a data amount

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of the content data transmitted from the transmission device (110) to the reception device (120) per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

4. The distribution system according to any of Claims 1 to 3, wherein the code rate determining means (131) is configured to determine the code rate with every change period set in advance.

5. The distribution system according to any of Claims 1 to 4, including a plurality of the reception devices (20a, 20b, 20c),

the distribution system, comprising a synchronous reproduction controlling means (32) for matching reproduction positions of the content to be reproduced by the plurality of the reception devices (20a, 20b, 20c), respectively, with each other among the plurality of the reception devices (20a, 20b, 20c).

6. The distribution system according to Claim 5, comprising a reproduction start time setting means (43) for setting the reproduction start time based on a target available reproduction time, which is a target value of the available reproduction time.

7. The distribution system according to Claim 5 or 6, wherein the content transmitting means (45) is configured to, when second reproduction start time, which is reproduction start time set for a second reception device as one of the plurality of the reception devices (20a, 20b, 20c), is later than first reproduction start time, which is reproduction start time set for a first reception device as another one of the plurality of the reception devices (20a, 20b, 20c), estimate a reproduction position of the content being reproduced by the first reception device at the second reproduction start time and transmit a portion of the content data at and after the estimated reproduction position to the second reception device.

8. The distribution system according to Claim 6 or 7, wherein the reproduction start time setting means (43) is configured to, for each reception device of the plurality of the reception devices (20a, 20b, 20c), calculate an each-device reproduction

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preparation time as a time required for the reception device (20a; 20b; 20c) to start reproduction of the content and set the reproduction start time based on a maximum value of the calculated each-device reproduction preparation time.

9. The distribution system according to any of Claims 6 to 8, wherein the reproduction start time setting means (43) is configured to set the reproduction start time based on an activation time, which is a time required for activation of an application program to be executed by the reception device (20a; 20b; 20c) for reproduction of the content, and the target available reproduction time.

10. The distribution system according to any of Claims 6 to 9, wherein the reproduction start time setting means (43) is configured to set the reproduction start time based on a communication speed, which is a data amount of the content data transmitted from the transmission device (10) to the reception device (20a; 20b; 20c) per unit time, and the target available reproduction time.

11. A distribution method applied to a distribution system including a transmission device and a reception device configured to be capable of communicating with each other, the distribution method comprising:

transmitting content data (S503), which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device, by the transmission device;

while receiving the content data transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data, by the reception device;

determining the code rate (S504) based on a remaining time before reproduction start time set for the reception device (120) as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device;

changing the code rate (S505) of the content data to be transmitted to the reception device to the determined code rate, by the transmission device; and

starting reproduction of the content (S506) at the set reproduction start time, by the reception device.

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12. The distribution method according to Claim 11, comprising:

determining a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

13. The distribution method according to Claim 12, comprising:

acquiring a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time; and

determining a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

14. The distribution method according to any of Claims 11 to 13, comprising:

determining the code rate with every change period set in advance.

15. The distribution method according to any of Claims 11 to 14, applied to the distribution system including a plurality of the reception devices, the distribution method comprising:

matching reproduction positions of the content to be reproduced by the plurality of the reception devices, respectively, with each other among the plurality of the reception devices.

16. A transmission device (110) configured to be capable of communicating with a reception device (120), the transmission device (110) comprising:

a content transmitting means (111) for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device (120),

wherein the content transmitting means (111) is configured to change the code rate of the content data to be transmitted to the reception device (120) to a code rate determined based on a remaining time before reproduction start time set for the reception device (120) as time at which the reception device (120) starts reproduction

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of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120).

17. The transmission device (110) according to Claim 16, comprising:

a code rate determining means (131) for determining the code rate based on the remaining time and the available reproduction time.

18. The transmission device (110) according to Claim 16 or 17, wherein the code rate determining means (131) is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

19. The transmission device (110) according to Claim 18, wherein the code rate determining means (131) is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device (110) to the reception device per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

20. The transmission device (110) according to any of Claims 16 to 19, wherein the code rate determining means (131) is configured to determine the code rate with every change period set in advance.

21. A program comprising instructions for causing a transmission device (110) configured to be capable of communicating with a reception device (120) to realize a content transmitting means (111) for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device (120),

wherein the content transmitting means (111) is configured to change the code rate of the content data to be transmitted to the reception device (120) to a code rate determined based on a remaining time before reproduction start time set for the

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reception device (120) as time at which the reception device (120) starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120).

22. A reception device (120) configured to be capable of communicating with a transmission device (110), the reception device (120) comprising:

a content reproducing means (121) for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device (110), storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means (131) for determining the code rate based on a remaining time before reproduction start time set for the reception device (120) as time to start reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device,

wherein the content reproducing means (121) is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

23. The reception device (120) according to Claim 22, wherein the code rate determining means (131) is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

24. The reception device (120) according to Claim 23, wherein the code rate determining means (131) is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device (110) to the reception device (120) per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

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25. The reception device (120) according to any of Claims 22 to 24, wherein the code rate determining means (131) is configured to determine the code rate with every change period set in advance.

26. A program comprising instructions for causing a reception device (120) according to any of Claims 22 to 25 to communicate ~~configured to be capable of communicating~~ with a transmission device (110) according to any of Claims 16 to 20. ~~to realize:~~

~~a content reproducing means (121) for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device (110), storing received data of the content data into a storage device and also reproducing the content based on the stored data, and~~

~~a code rate determining means (131) for determining the code rate based on a remaining time before reproduction start time set for the reception device (120) as time at which the reception device (120) starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120),~~

~~wherein the content reproducing means (121) is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.~~

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Fig.1

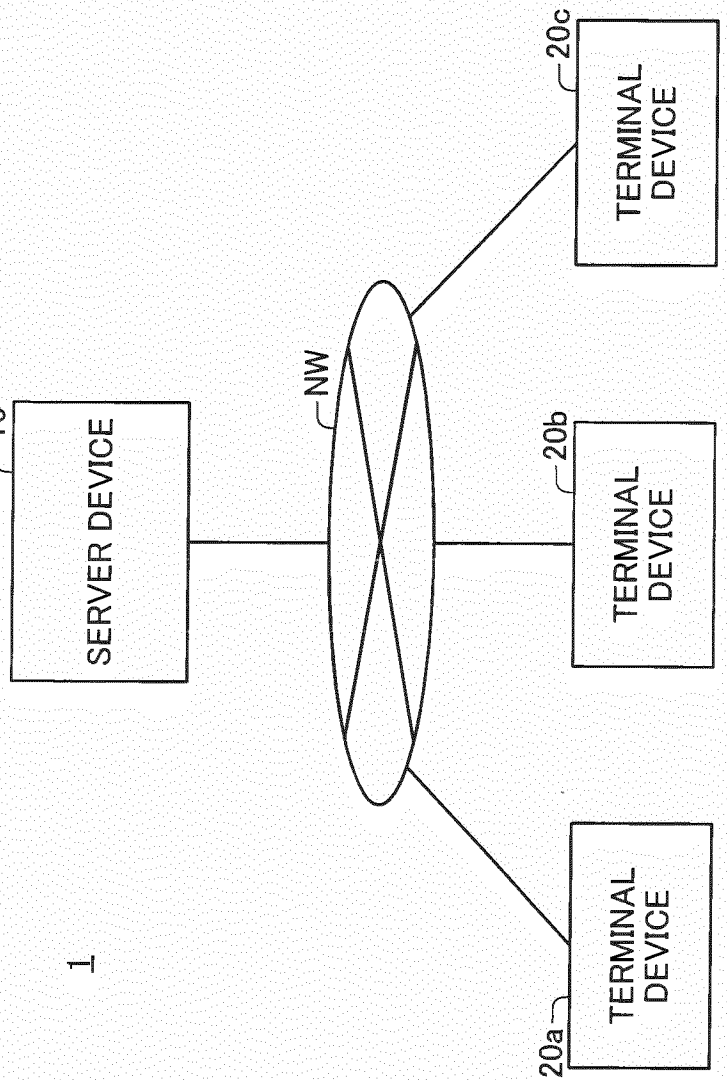

1
SERVER DEVICE
10
NW
TERMINAL DEVICE
20a
TERMINAL DEVICE
20b
TERMINAL DEVICE
20c

Fig.2

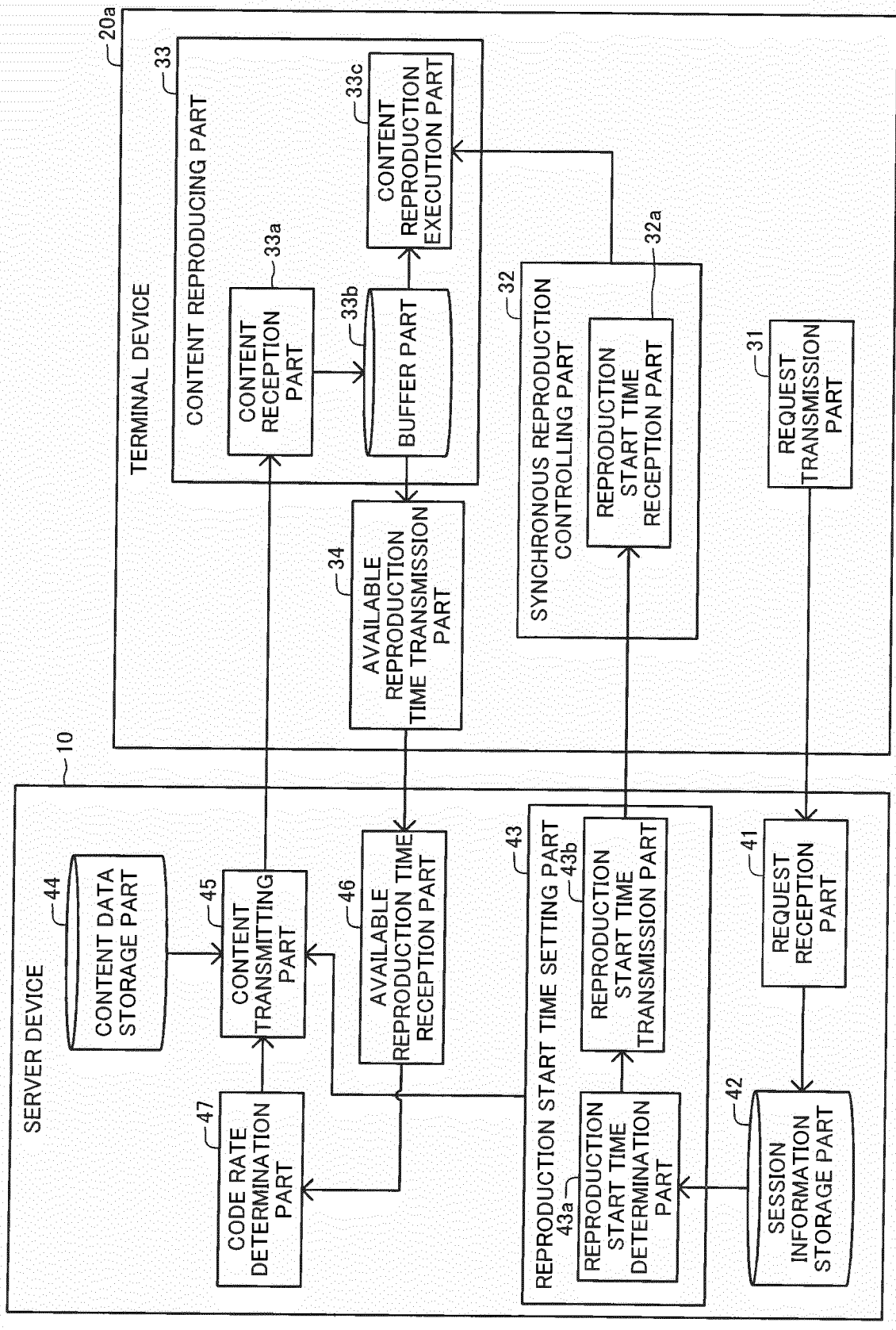

20a
TERMINAL DEVICE
33
CONTENT REPRODUCING PART
33a
CONTENT RECEPTION PART
33b
BUFFER PART
33c
CONTENT REPRODUCTION EXECUTION PART
34
AVAILABLE REPRODUCTION TIME TRANSMISSION PART
32
SYNCHRONOUS REPRODUCTION CONTROLLING PART
32a
REPRODUCTION START TIME RECEPTION PART
31
REQUEST TRANSMISSION PART
10
SERVER DEVICE
44
CONTENT DATA STORAGE PART
45
CONTENT TRANSMITTING PART
46
AVAILABLE REPRODUCTION TIME RECEPTION PART
43
REPRODUCTION START TIME SETTING PART
43b
REPRODUCTION START TIME TRANSMISSION PART
41
REQUEST RECEPTION PART
47
CODE RATE DETERMINATION PART
43a
REPRODUCTION START TIME DETERMINATION PART
42
SESSION INFORMATION STORAGE PART

Fig.3

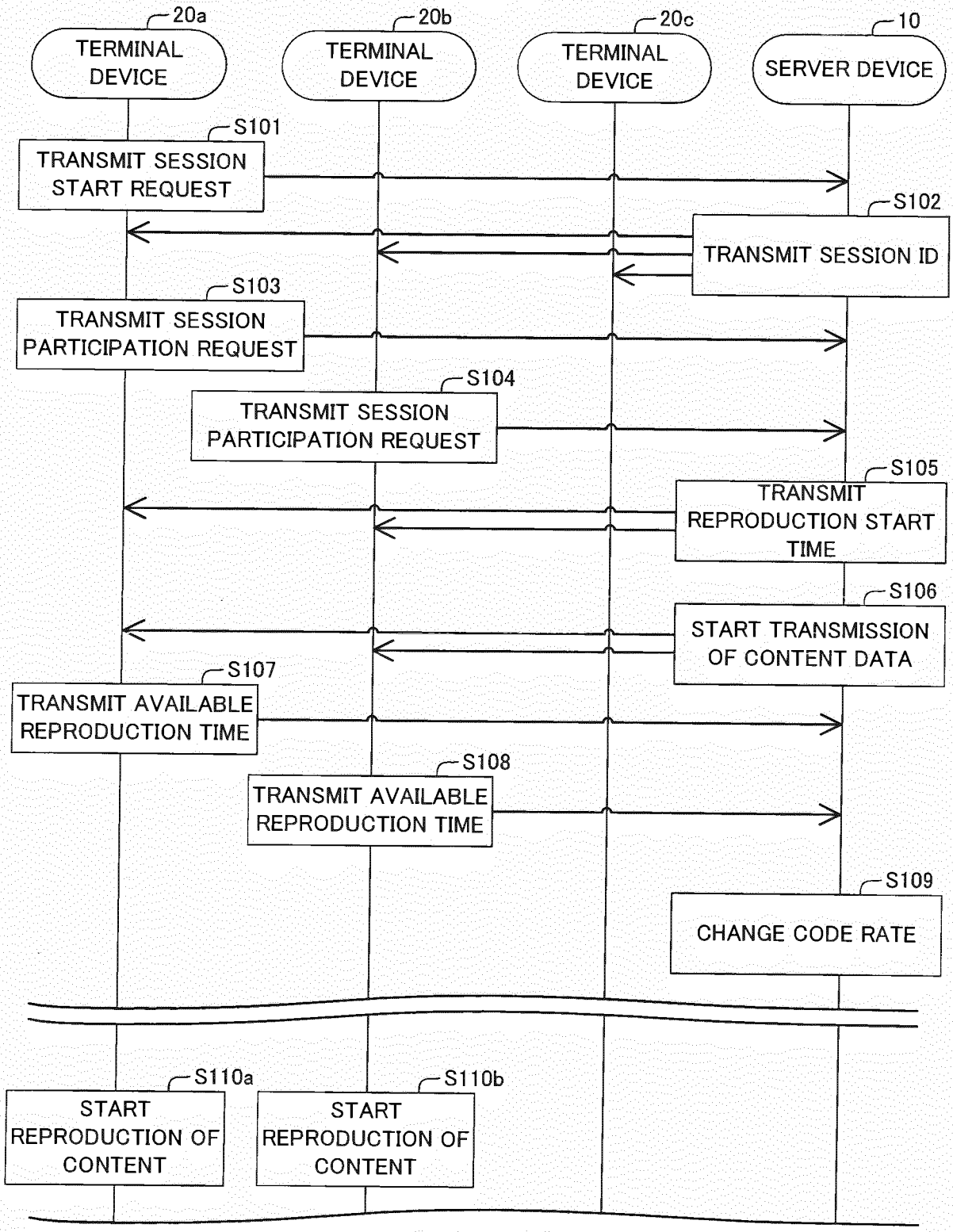

20a
TERMINAL DEVICE
20b
TERMINAL DEVICE
20c
TERMINAL DEVICE
10
SERVER DEVICE
S101
TRANSMIT SESSION START REQUEST
S102
TRANSMIT SESSION ID
S103
TRANSMIT SESSION PARTICIPATION REQUEST
S104
TRANSMIT SESSION PARTICIPATION REQUEST
S105
TRANSMIT REPRODUCTION START TIME
S106
START TRANSMISSION OF CONTENT DATA
S107
TRANSMIT AVAILABLE REPRODUCTION TIME
S108
TRANSMIT AVAILABLE REPRODUCTION TIME
S109
CHANGE CODE RATE
S110a
START REPRODUCTION OF CONTENT
S110b
START REPRODUCTION OF CONTENT

Fig.4

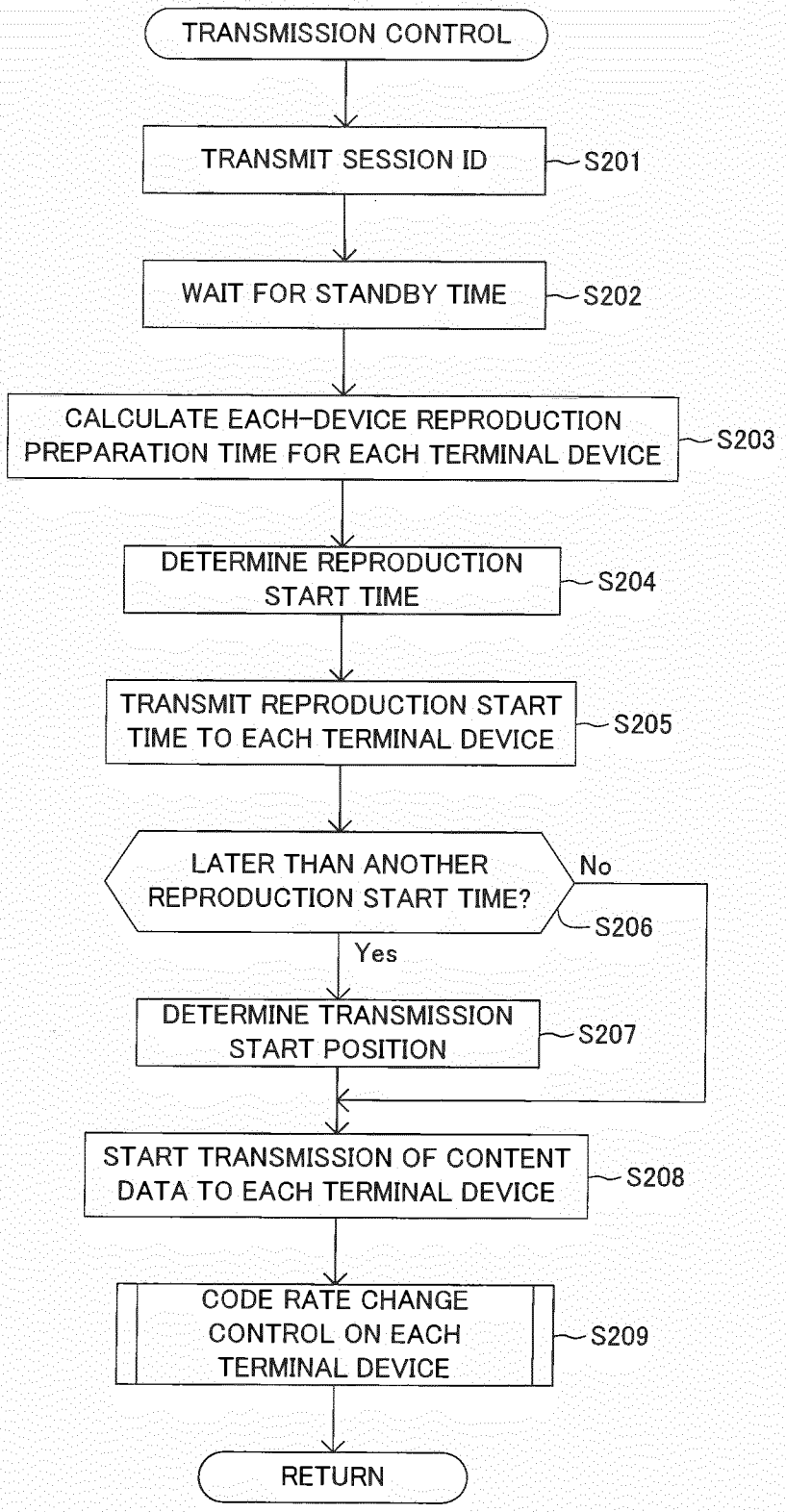

TRANSMISSION CONTROL
TRANSMIT SESSION ID
S201
WAIT FOR STANDBY TIME
S202
CALCULATE EACH-DEVICE REPRODUCTION PREPARATION TIME FOR EACH TERMINAL DEVICE
S203
DETERMINE REPRODUCTION START TIME
S204
TRANSMIT REPRODUCTION START TIME TO EACH TERMINAL DEVICE
S205
LATER THAN ANOTHER REPRODUCTION START TIME?
No
S206
Yes
DETERMINE TRANSMISSION START POSITION
S207
START TRANSMISSION OF CONTENT DATA TO EACH TERMINAL DEVICE
S208
CODE RATE CHANGE CONTROL ON EACH TERMINAL DEVICE
S209
RETURN

Fig.5

SESSION ID	CONTENT ID	TERMINAL ID	ACTIVATION TIME	COMMUNICATION SPEED	REPRODUCTION START TIME
S01	C01	R01			
S01	C01	R02			
S01	C01	R03			
...	...	...	...	...	...

Fig.6

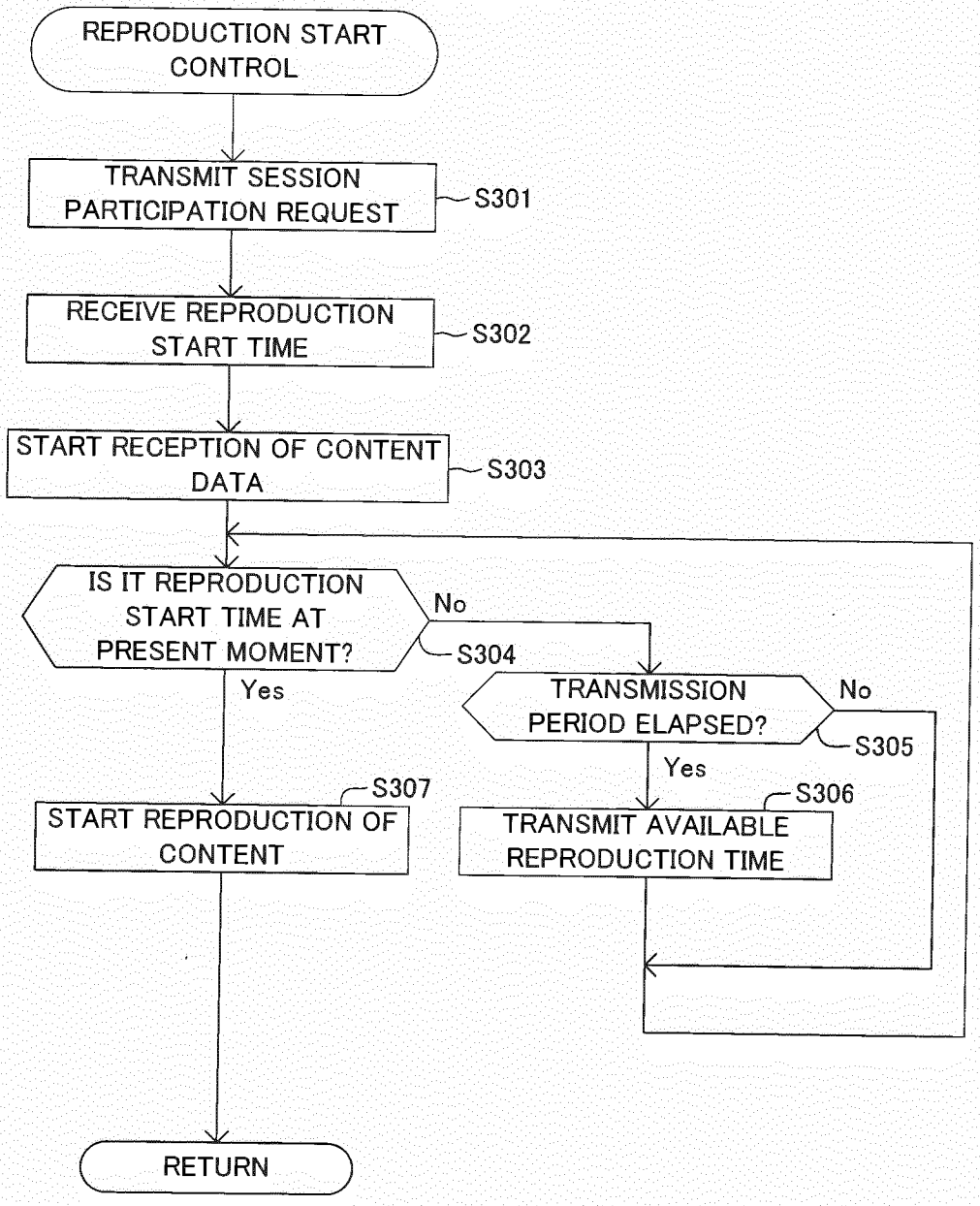

REPRODUCTION START CONTROL
TRANSMIT SESSION PARTICIPATION REQUEST
S301
RECEIVE REPRODUCTION START TIME
S302
START RECEPTION OF CONTENT DATA
S303
IS IT REPRODUCTION START TIME AT PRESENT MOMENT?
S304
No
Yes
TRANSMISSION PERIOD ELAPSED?
No
S305
Yes
S306
TRANSMIT AVAILABLE REPRODUCTION TIME
S307
START REPRODUCTION OF CONTENT
RETURN

Fig.7

SESSION ID	CONTENT ID	TERMINAL ID	ACTIVATION TIME	COMMUNICATION SPEED	REPRODUCTION START TIME
S01	C01	R01	1200	3	
S01	C01	R02	1000	50	
S01	C01	R03			
⋮	⋮	⋮	⋮	⋮	⋮

Fig.8

SESSION ID	CONTENT ID	TERMINAL ID	ACTIVATION TIME	COMMUNICATION SPEED	REPRODUCTION START TIME
S01	C01	R01	1200	3	13:01:34
S01	C01	R02	1000	50	13:01:34
S01	C01	R03			
⋮	⋮	⋮	⋮	⋮	⋮

Fig.9

SESSION ID	TERMINAL ID	AVAILABLE REPRODUCTION TIME	REMAINING TIME	CODE RATE
S01	R01	0	31	2
S01	R02	0	31	50
⋮	⋮	⋮	⋮	⋮

Fig.10

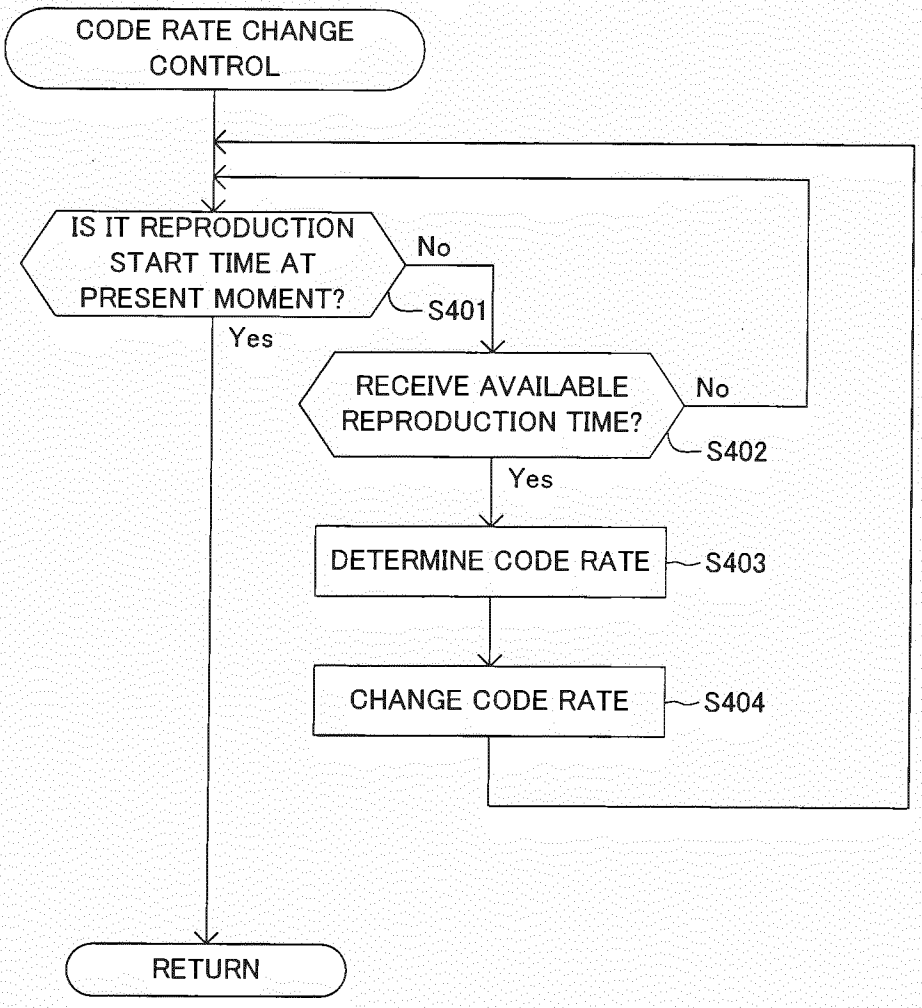

CODE RATE CHANGE CONTROL
IS IT REPRODUCTION START TIME AT PRESENT MOMENT?
No
S401
Yes
RECEIVE AVAILABLE REPRODUCTION TIME?
No
S402
Yes
DETERMINE CODE RATE
S403
CHANGE CODE RATE
S404
RETURN

Fig.11

SESSION ID	TERMINAL ID	AVAILABLE REPRODUCTION TIME	REMAINING TIME	CODE RATE
S01	R01	0	31	2
S01	R02	0	31	50
S01	R01	7	26	2
S01	R02	2	26	16
...	...	...	...	...

Fig.12

SESSION ID	TERMINAL ID	AVAILABLE REPRODUCTION TIME	REMAINING TIME	CODE RATE
S01	R01	0	31	2
S01	R02	0	31	50
S01	R01	7	26	2
S01	R02	2	26	16
S01	R01	18	21	4
S01	R02	14	21	50
⋮	⋮	⋮	⋮	⋮

Fig.13

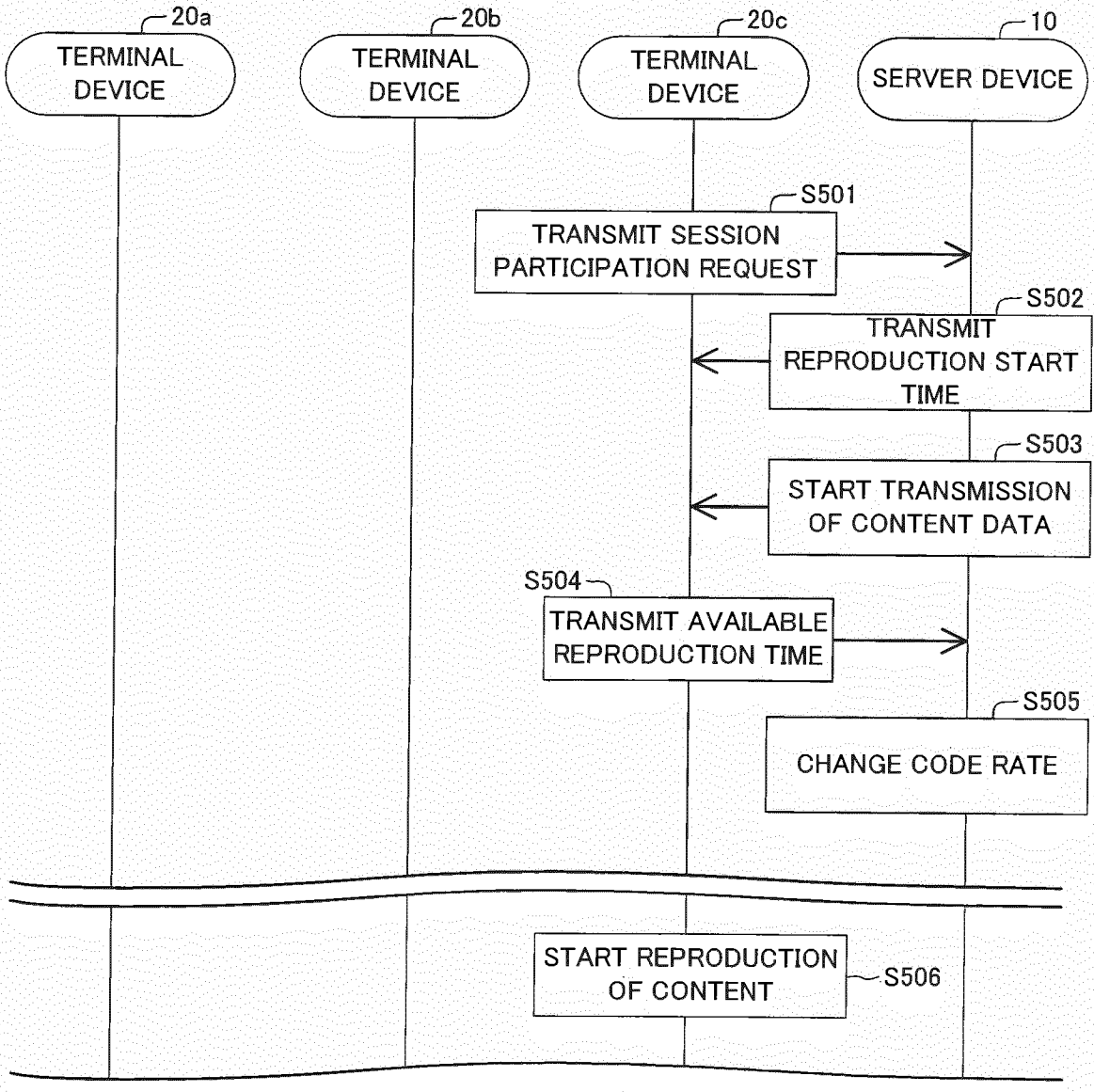

20a
TERMINAL DEVICE
20b
TERMINAL DEVICE
20c
TERMINAL DEVICE
10
SERVER DEVICE
S501
TRANSMIT SESSION PARTICIPATION REQUEST
S502
TRANSMIT REPRODUCTION START TIME
S503
START TRANSMISSION OF CONTENT DATA
S504
TRANSMIT AVAILABLE REPRODUCTION TIME
S505
CHANGE CODE RATE
START REPRODUCTION OF CONTENT
S506

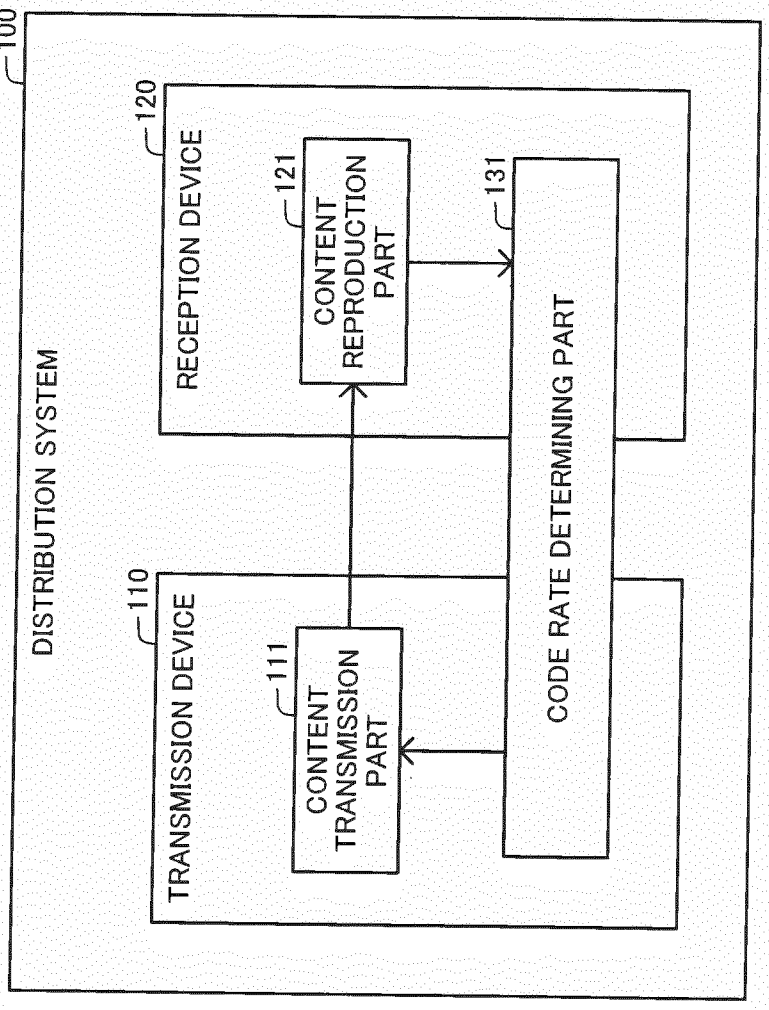
Fig.14

SESSION ID	CONTENT ID	TERMINAL ID	ACTIVATION TIME	COMMUNICATION SPEED	REPRODUCTION START TIME
S01	C01	R01	1200	3	13:01:34
S01	C01	R02	1000	50	13:01:34
S01	C01	R03	1500	8	
⋮	⋮	⋮	⋮	⋮	⋮

Fig.15

SESSION ID	CONTENT ID	TERMINAL ID	ACTIVATION TIME	COMMUNICATION SPEED	REPRODUCTION START TIME
S01	C01	R01	1200	3	13:01:34
S01	C01	R02	1000	50	13:01:34
S01	C01	R03	1500	8	13:05:25
⋮	⋮	⋮	⋮	⋮	⋮

Fig.16


100
DISTRIBUTION SYSTEM
120
RECEPTION DEVICE
121
CONTENT REPRODUCTION PART
131
CODE RATE DETERMINING PART
110
TRANSMISSION DEVICE
111
CONTENT TRANSMISSION PART

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Date
14.11.16

Reference	Application No./Patent No.
NBA 038 WO/EP	10828052.0 - 1905 / 2498492
Applicant/Proprietor	
NEC Corporation	

Revocation of the automatic debit order

Application No. 10828052.0

The revocation of the automatic debit order for deposit account no. 28000531 was received on 09.11.16.

The automatic debit order for the above application thus ceased to be effective as from that date.

For the Examining Division

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revocation of automatic debit order

Thank you for your instruction to revoke this automatic debit order sent to the EPO on 09.11.2016 12:16 (CET).

The automatic debit order for the following application or for the European patent with unitary effect ceased to be effective on the date of receipt of your instruction revoking it. The European Patent Office will send you an official communication about the revocation in the next few days.

Deposit Account:	28000531
Deposit Account Holder:	Betten & Resch
Requested by:	Manuel Rodríguez Flórez

Application No.	Reference
108280520	NBA 038 WO/EP

Application No.	Reference

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Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	4149742
Application number	EP10828052.0
Date of receipt	25 February 2016
Receiving Office	European Patent Office, The Hague
Your reference	NBA 038 WO/EP
Applicant	All applicants as on file
Documents submitted	package-data.xml epf1038.pdf (1 p.) ep-sfd-request.xml EPLETT-01.pdf\EP Reply to Office Action - EPO with enclosures.PDF (19 p.)
Submitted by	CN=Sandra Thiemt 37881
Method of submission	Online
Date and time receipt generated	25 February 2016, 11:09 (CET)
Message Digest	35:4A:B9:99:2A:2D:2A:99:83:48:0B:C0:94:1D:30:29:D7:E3:E1:9C

Correction by the EPO of errors in debit instructions filed by eOLF
Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

NEW CLAIMS

1. A distribution system (100), including a transmission device (110) and a reception device (120) configured to be capable of communicating with each other,

the transmission device (110) being equipped with a content transmitting means (111) for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device (120), and

the reception device (120) being equipped with a content reproducing means (121) for, while receiving the content data transmitted by the transmission device (110), storing received data of the content data into a storage device and also reproducing the content based on the stored data,

the distribution system, comprising a code rate determining means (131) for determining the code rate based on a remaining time before reproduction start time set for the reception device (120) as time at which the reception device (120) starts reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120), wherein:

the content transmitting means (111) is configured to change the code rate of the content data to be transmitted to the reception device (120) to the determined code rate; and

the content reproducing means (121) is configured to start reproduction of the content at the set reproduction start time.

2. The distribution system according to Claim 1, wherein the code rate determining means (131) is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

3. The distribution system according to Claim 2, wherein the code rate determining means (131) is configured to acquire a communication speed, which is a data amount

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of the content data transmitted from the transmission device (110) to the reception device (120) per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

4. The distribution system according to any of Claims 1 to 3, wherein the code rate determining means (131) is configured to determine the code rate with every change period set in advance.

5. The distribution system according to any of Claims 1 to 4, including a plurality of the reception devices (20a, 20b, 20c),

the distribution system, comprising a synchronous reproduction controlling means (32) for matching reproduction positions of the content to be reproduced by the plurality of the reception devices (20a, 20b, 20c), respectively, with each other among the plurality of the reception devices (20a, 20b, 20c).

6. The distribution system according to Claim 5, comprising a reproduction start time setting means (43) for setting the reproduction start time based on a target available reproduction time, which is a target value of the available reproduction time.

7. The distribution system according to Claim 5 or 6, wherein the content transmitting means (45) is configured to, when second reproduction start time, which is reproduction start time set for a second reception device as one of the plurality of the reception devices (20a, 20b, 20c), is later than first reproduction start time, which is reproduction start time set for a first reception device as another one of the plurality of the reception devices (20a, 20b, 20c), estimate a reproduction position of the content being reproduced by the first reception device at the second reproduction start time and transmit a portion of the content data at and after the estimated reproduction position to the second reception device.

8. The distribution system according to Claim 6 or 7, wherein the reproduction start time setting means (43) is configured to, for each reception device of the plurality of the reception devices (20a, 20b, 20c), calculate an each-device reproduction

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preparation time as a time required for the reception device (20a; 20b; 20c) to start reproduction of the content and set the reproduction start time based on a maximum value of the calculated each-device reproduction preparation time.

9. The distribution system according to any of Claims 6 to 8, wherein the reproduction start time setting means (43) is configured to set the reproduction start time based on an activation time, which is a time required for activation of an application program to be executed by the reception device (20a; 20b; 20c) for reproduction of the content, and the target available reproduction time.

10. The distribution system according to any of Claims 6 to 9, wherein the reproduction start time setting means (43) is configured to set the reproduction start time based on a communication speed, which is a data amount of the content data transmitted from the transmission device (10) to the reception device (20a; 20b; 20c) per unit time, and the target available reproduction time.

11. A distribution method applied to a distribution system including a transmission device and a reception device configured to be capable of communicating with each other, the distribution method comprising:

transmitting content data (S503), which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device, by the transmission device;

while receiving the content data transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data, by the reception device;

determining the code rate (S504) based on a remaining time before reproduction start time set for the reception device (120) as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device;

changing the code rate (S505) of the content data to be transmitted to the reception device to the determined code rate, by the transmission device; and

starting reproduction of the content (S506) at the set reproduction start time, by the reception device.

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12. The distribution method according to Claim 11, comprising:

determining a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

13. The distribution method according to Claim 12, comprising:

acquiring a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time; and

determining a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

14. The distribution method according to any of Claims 11 to 13, comprising:

determining the code rate with every change period set in advance.

15. The distribution method according to any of Claims 11 to 14, applied to the distribution system including a plurality of the reception devices, the distribution method comprising:

matching reproduction positions of the content to be reproduced by the plurality of the reception devices, respectively, with each other among the plurality of the reception devices.

16. A transmission device (110) configured to be capable of communicating with a reception device (120), the transmission device (110) comprising:

a content transmitting means (111) for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device (120),

wherein the content transmitting means (111) is configured to change the code rate of the content data to be transmitted to the reception device (120) to a code rate determined based on a remaining time before reproduction start time set for the reception device (120) as time at which the reception device (120) starts reproduction

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of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120).

17. The transmission device (110) according to Claim 16, comprising:

a code rate determining means (131) for determining the code rate based on the remaining time and the available reproduction time.

18. The transmission device (110) according to Claim 16 or 17, wherein the code rate determining means (131) is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

19. The transmission device (110) according to Claim 18, wherein the code rate determining means (131) is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device (110) to the reception device per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

20. The transmission device (110) according to any of Claims 16 to 19, wherein the code rate determining means (131) is configured to determine the code rate with every change period set in advance.

21. A program comprising instructions for causing a transmission device (110) configured to be capable of communicating with a reception device (120) to realize a content transmitting means (111) for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device (120),

wherein the content transmitting means (111) is configured to change the code rate of the content data to be transmitted to the reception device (120) to a code rate determined based on a remaining time before reproduction start time set for the

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reception device (120) as time at which the reception device (120) starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120).

22. A reception device (120) configured to be capable of communicating with a transmission device (110), the reception device (120) comprising:

a content reproducing means (121) for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device (110), storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means (131) for determining the code rate based on a remaining time before reproduction start time set for the reception device (120) as time to start reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device,

wherein the content reproducing means (121) is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

23. The reception device (120) according to Claim 22, wherein the code rate determining means (131) is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

24. The reception device (120) according to Claim 23, wherein the code rate determining means (131) is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device (110) to the reception device (120) per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

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25. The reception device (120) according to any of Claims 22 to 24, wherein the code rate determining means (131) is configured to determine the code rate with every change period set in advance.

26. A program comprising instructions for causing a reception device (120) configured to be capable of communicating with a transmission device (110) to realize:

a content reproducing means (121) for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device (110), storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means (131) for determining the code rate based on a remaining time before reproduction start time set for the reception device (120) as time at which the reception device (120) starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120),

wherein the content reproducing means (121) is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

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NEW CLAIMS

1. A distribution system (100), including a transmission device (110) and a reception device (120) configured to be capable of communicating with each other,

the transmission device (110) being equipped with a content transmitting means (111) for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device (120), and

the reception device (120) being equipped with a content reproducing means (121) for, while receiving the content data transmitted by the transmission device (110), storing received data of the content data into a storage device and also reproducing the content based on the stored data,

the distribution system, comprising a code rate determining means (131) for determining the code rate based on a remaining time before reproduction start time set for the reception device (120) as time at which the reception device (120) starts reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120), wherein:

the content transmitting means (111) is configured to change the code rate of the content data to be transmitted to the reception device (120) to the determined code rate; and

the content reproducing means (121) is configured to start reproduction of the content at the set reproduction start time.

2. The distribution system according to Claim 1, wherein the code rate determining means (131) is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

3. The distribution system according to Claim 2, wherein the code rate determining means (131) is configured to acquire a communication speed, which is a data amount

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of the content data transmitted from the transmission device (110) to the reception device (120) per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

4. The distribution system according to any of Claims 1 to 3, wherein the code rate determining means (131) is configured to determine the code rate with every change period set in advance.

5. The distribution system according to any of Claims 1 to 4, including a plurality of the reception devices (20a, 20b, 20c),

the distribution system, comprising a synchronous reproduction controlling means (32) for matching reproduction positions of the content to be reproduced by the plurality of the reception devices (20a, 20b, 20c), respectively, with each other among the plurality of the reception devices (20a, 20b, 20c).

6. The distribution system according to Claim 5, comprising a reproduction start time setting means (43) for setting the reproduction start time based on a target available reproduction time, which is a target value of the available reproduction time.

7. The distribution system according to Claim 5 or 6, wherein the content transmitting means (45) is configured to, when second reproduction start time, which is reproduction start time set for a second reception device as one of the plurality of the reception devices (20a, 20b, 20c), is later than first reproduction start time, which is reproduction start time set for a first reception device as another one of the plurality of the reception devices (20a, 20b, 20c), estimate a reproduction position of the content being reproduced by the first reception device at the second reproduction start time and transmit a portion of the content data at and after the estimated reproduction position to the second reception device.

8. The distribution system according to Claim 6 or 7, wherein the reproduction start time setting means (43) is configured to, for each reception device of the plurality of the reception devices (20a, 20b, 20c), calculate an each-device reproduction

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preparation time as a time required for the reception device (20a; 20b; 20c) to start reproduction of the content and set the reproduction start time based on a maximum value of the calculated each-device reproduction preparation time.

9. The distribution system according to any of Claims 6 to 8, wherein the reproduction start time setting means (43) is configured to set the reproduction start time based on an activation time, which is a time required for activation of an application program to be executed by the reception device (20a; 20b; 20c) for reproduction of the content, and the target available reproduction time.

10. The distribution system according to any of Claims 6 to 9, wherein the reproduction start time setting means (43) is configured to set the reproduction start time based on a communication speed, which is a data amount of the content data transmitted from the transmission device (10) to the reception device (20a; 20b; 20c) per unit time, and the target available reproduction time.

11. A distribution method applied to a distribution system including a transmission device and a reception device configured to be capable of communicating with each other, the distribution method comprising:

transmitting content data (S503), which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device, by the transmission device;

while receiving the content data transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data, by the reception device;

determining the code rate (S504) based on a remaining time before reproduction start time set for the reception device (120) as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device;

changing the code rate (S505) of the content data to be transmitted to the reception device to the determined code rate, by the transmission device; and

starting reproduction of the content (S506) at the set reproduction start time, by the reception device.

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12. The distribution method according to Claim 11, comprising:

determining a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

13. The distribution method according to Claim 12, comprising:

acquiring a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time; and

determining a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

14. The distribution method according to any of Claims 11 to 13, comprising:

determining the code rate with every change period set in advance.

15. The distribution method according to any of Claims 11 to 14, applied to the distribution system including a plurality of the reception devices, the distribution method comprising:

matching reproduction positions of the content to be reproduced by the plurality of the reception devices, respectively, with each other among the plurality of the reception devices.

16. A transmission device (110) configured to be capable of communicating with a reception device (120), the transmission device (110) comprising:

a content transmitting means (111) for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device (120),

wherein the content transmitting means (111) is configured to change the code rate of the content data to be transmitted to the reception device (120) to a code rate determined based on a remaining time before reproduction start time set for the reception device (120) as time at which the reception device (120) starts reproduction

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of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120).

17. The transmission device (110) according to Claim 16, comprising:

a code rate determining means (131) for determining the code rate based on the remaining time and the available reproduction time.

18. The transmission device (110) according to Claim 16 or 17, wherein the code rate determining means (131) is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

19. The transmission device (110) according to Claim 18, wherein the code rate determining means (131) is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device (110) to the reception device per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

20. The transmission device (110) according to any of Claims 16 to 19, wherein the code rate determining means (131) is configured to determine the code rate with every change period set in advance.

21. A program comprising instructions for causing a transmission device (110) configured to be capable of communicating with a reception device (120) to realize a content transmitting means (111) for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device (120),

wherein the content transmitting means (111) is configured to change the code rate of the content data to be transmitted to the reception device (120) to a code rate determined based on a remaining time before reproduction start time set for the

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reception device (120) as time at which the reception device (120) starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120).

22. A reception device (120) configured to be capable of communicating with a transmission device (110), the reception device (120) comprising:

a content reproducing means (121) for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device (110), storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means (131) for determining the code rate based on a remaining time before reproduction start time set for the reception device (120) as time to start reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device,

wherein the content reproducing means (121) is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

23. The reception device (120) according to Claim 22, wherein the code rate determining means (131) is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

24. The reception device (120) according to Claim 23, wherein the code rate determining means (131) is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device (110) to the reception device (120) per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

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25. The reception device (120) according to any of Claims 22 to 24, wherein the code rate determining means (131) is configured to determine the code rate with every change period set in advance.

26. A program comprising instructions for causing a reception device (120) configured to be capable of communicating with a transmission device (110) to realize:

a content reproducing means (121) for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device (110), storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means (131) for determining the code rate based on a remaining time before reproduction start time set for the reception device (120) as time at which the reception device (120) starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120),

wherein the content reproducing means (121) is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

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Letter accompanying subsequently filed items

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	10828052.0
Applicant's or representative's reference	NBA 038 WO/EP

	Description of document	Original file name	Assigned file name
1	Letter relating to the search and examination procedure	EP Reply to Office Action - EPO with enclosures.PDF	EPLETT-01.pdf

Signatures

Place:	**Munich**
Date:	**25 February 2016**
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80298 Munich

February 24, 2016

European Patent Application 10828052.0
"Distribution system"
NEC Corporation
Our File: NBA 038 WO/EP S/MG/MH

In response to the communication pursuant to Article 94(3) EPC dated December 21, 2015.

The applicant herewith respectfully submits new claims 1 to 26 which are to replace the claims as presently on file and on which the further examination is to be based.

I. New claims 1 to 26: Amendments and their disclosure

The new claims are based on the previous claims which have been amended to further emphasize the features of the present invention. The amendments made to the new claims have been identified by underlining introductions and ~~striking through~~ cancellations. Support for the amendments made will be indicated hereinbelow.

New claim 1 is based on previous claim 1 which has been amended by defining "reproduction start time set *for the reception device* ...".

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As to the original disclosure reference is made to e.g. paragraphs [0154], [0157], [0158], [0160], and [0166] to [0168].

New claims 11, 16, 21, 22 and 26 which are based on previous claim 11, 16, 21, 22 and 26, respectively, have been amended in accordance with the amendments made to new claim 1.

New claims 2 to 10, 12 to 15, 17 to 20, and 23 to 25 correspond to respective previous claims, the subject-matter of which remains unchanged.

The amendments made to the new claims and the new claims as such are supported by the original disclosure and therefore meet the requirements of Article 123(2) EPC.

II. New claims 1, 11, 16, 21, 22, and 26: Unity

In section 2, the Examiner still alleges that the subject-matter of the previous claims lacks unity within the meaning of Article 82 EPC. To be more specific, the Examiner alleges that the subject-matter of previous claims 1, 11, 16, 21, 22, and 26 is not novel over the disclosure of D1 (see item 2.2), whereas the alleged special technical features of the remaining claims do not form a single general inventive concept, rather diverge from each other (see items 2.1, 2.4, and 2.5).

The Examiner furthermore requests in section 5 to state upon which invention, i.e., the inventions indicated in item 2.1, further prosecution of the present application should be based and limit the present application accordingly.

However, as will be discussed in more detail below, the subject-matter of previous (new) claims 1, 11, 16, 21, 22, and 26 is not disclosed, in combination, in the disclosure of D1 and therefore novel thereover. That is, there are features in the claims not being disclosed in D1 and thus forming (potential) special technical

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features. Since these special technical features are neither taught nor suggested by the cited documents, and thus the prior art on hand, they solve a single general inventive concept. The subject-matter of the present application is therefore to be regarded as to comply with the requirements concerning unity in the sense of Article 82 EPC.

Accordingly, the invention on which the further prosecution of the present application is to be based is the first invention indicated in item 2.1. However, since the present application does not lack unity, it is presently not considered necessary to limit it.

III. New claims 1, 11, 16, 21, 22, and 26: Novelty and inventive step

New claim 1 directed to a distribution system including a transmission device and a reception device configured to be capable of communicating with each other comprises, *inter alia*, a code rate determining means for determining the code rate based on a remaining time before reproduction start time set for the reception device. This feature is in contrast to the Examiner's allegation not disclosed in or at least different from the disclosure of D1.

Firstly, D1 teaches "packets have a playout timestamp" and "remaining playout duration time" indicates "a time difference between a scheduled playout time of said selected packet and a current time". Moreover, D1 also teaches "a packet stored in the receiver buffer" and "a remaining playout duration time" is calculated based on "a scheduled playout time of a received packet". *See* D1 at column 5, lines 4 to 24.

On the other hand, "a remaining time before reproduction start time" as recited in new (previous) claim 1 indicates "a remaining time before reproduction start time set for the reception device". That is, by comparison with D1, "a reproduction start time" according to the present invention is not set in packets, and is not determined from a received packet stored in a receiver buffer.

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Likewise, according to the present invention, a code rate is determined based on "a remaining time before reproduction start time set for the reception device". Accordingly, contrary to D1, the reception device has the information, i.e., the remaining time before reproduction start time set for the reception device, for calculating the code rate. According to D1, the remaining playout duration time is calculated on the scheduled playout time of the received packet.

As a result, reproduction of content at reproduction start time set for the reception device can be securely started according to the present invention.

Furthermore, according to D1, a code rate is determined from occupancy level of a receiver buffer. On the contrary, in the present invention, even if an available reproduction time based on capacity of a receiver buffer is short, it is possible to set a code rate to a relatively large value when the above-mentioned remaining time is long.

The subject-matter of new (previous) claim 1 therefore is to be regarded as being novel over cited document D1 in accordance with Article 54(1) and (2) EPC.

With the above-mentioned features, it is possible to set a code rate to a relatively large value when the remaining time is long even if an available reproduction time based on the capacity of the receiver buffer is short. As a result, the present invention enables a code rate to avoid meaninglessly lowering. *See* e.g. paragraph [0156].

The problem underlying the present invention may therefore be formulated to provide a distribution system including a transmission device and a reception device with which it is possible to cause the reception device to securely start reproduction of the content transmitted by transmission device at the reproduction start time while avoiding meaninglessly lowering the code rate of the content transmitted.

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D1 does not provide disclosure, teaching or suggestion with regard to the above-mentioned (distinguishing) features and/or any other solution for the problem derived. Accordingly, the distinguishing features are not rendered obvious.

The skilled person would furthermore not take into consideration a combination of D1 with one or more of the other cited documents because these documents as already discussed in the previous response do not provide disclosure with regard to the above-mentioned distinguishing features. So, the skilled person does not arrive at the solution according to the present invention. The distinguishing features are therefore regarded as being not rendered obvious.

The subject-matter of new claim 1 therefore is to be regarded as involving an inventive step in accordance with Article 56 EPC. Since new (previous) claims 1, 16, 21, 22, and 26 all comprise features corresponding to those of new claim 1, the above applies *mutatis mutandis*.

IV. Conclusion

The applicant is of the opinion that all objections raised in the communication have been addressed and should be overcome with the newly submitted documents. It therefore is respectfully suggested to acknowledge patentability.

Only as a precaution it is requested not to issue a negative decision without having issued a further office action or having given to the applicant the opportunity for an informal interview or, auxiliarily only, oral proceedings.



Franz-Josef Schöniger

Enclosures
New claims 1 to 26 (annotated and clean copy)

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The examination is being carried out on the **following application documents**

Description, Pages

1-3, 5-58	as published			
4, 4a	received on	24-11-2015	with letter of	24-11-2015

Claims, Numbers

1-26	received on	24-11-2015	with letter of	24-11-2015

Drawings, Sheets

1/14-14/14	as published

Reference is made to the following documents; the numbering will be adhered to in the rest of the procedure.

D1 US 7 606 928 B2 (WANG RU-SHANG [US] ET AL)
20 October 2009 (2009-10-20)

D2 US 2007/133405 A1 (BOWRA TODD [US] ET AL)
14 June 2007 (2007-06-14)

D3 BORONAT F ET AL: "Multimedia group and inter-stream synchronization techniques: A comparative study",
INFORMATION SYSTEMS, PERGAMON PRESS, OXFORD, GB,
vol. 34, no. 1, 1 March 2009 (2009-03-01), pages 108-131,
XP025644936,
ISSN: 0306-4379, DOI: 10.1016/J.IS.2008.05.001
[retrieved on 2008-05-24]

1 References

R1 European Search Opinion dated 09-06-2015

R2 Applicant's reply to R1 dated 24-11-2015

2 Non-Unity

The application lacks unity within the meaning of Article 82 EPC, for the following reasons:

2.1 Group of Inventions

The following separate inventions or groups of inventions are not linked as to form a single general inventive concept:

I. Claims: 1-3, 11-13, 16-19, 21-24 and 26
Code rate determining means using time-value buffer and network statistics

II. Claims: 4, 14, 20 and 25
Details regarding the timing of the code rate determination

III. Claims: 5-10 and 15
Use of a synchronous reproduction controlling means

2.2 Prior Art

Seen in the light of the first claim of the present application, document D1 describes (while repeating the wording of claim 1, the references in parentheses apply to this document):
A distribution system (multimedia streaming system 10 in fig. 3)*, including a transmission device* (sender 20 in fig. 3) *and a reception device* (receiver 50 in fig. 3) *configured to be capable of communicating with each other* (p. 6, l. 58 - p. 7, l. 22; fig. 3)*,*

- *the transmission device being equipped with a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device* (p. 6, l. 58 - p. 7, l. 22; fig. 3)*, and*
- *the reception device being equipped with a content reproducing means* (decoder/player 52 in fig. 3) *for, while receiving the content data transmitted by the transmission device* (RTP/RTCP module 56 in fig. 3)*, storing received data of the content data into a storage device* (receiver buffer 54 in fig. 3) *and also reproducing the content based on the stored data* (p. 6, l. 62-67; fig. 3)*,*

- *the distribution system, comprising a code rate determining means* (session QoS manager 22 in fig. 3) *for determining the code rate based on a remaining time* (current time) *before reproduction start time* (scheduled playout time) *set as time at which the reception device starts reproduction of the content from a present moment and based on an available reproduction time* (remaining playout duration time)*, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device* (p. 2, l. 50-57; p. 3, l. 25-36; p. 7, l. 1-22; fig. 3)*, wherein:*
- *the content transmitting means is configured to change the code rate of the content data to be transmitted to the reception device to the determined code rate* (p. 6, l. 67 - p. 7, l. 22)*; and*
- *the content reproducing means is configured to start reproduction of the content at the set reproduction start time* (p. 2, l. 50-57)*.*

Thus, the subject-matter of claim 1 is not new over the disclosure of D1. The same reasoning applies, mutatis mutandis, to the subject-matter of the corresponding independent claims 11, 16, 21, 22 and 26.

2.3 Reference to Applicant's Arguments

Reference is made to the applicant's arguments received with the letter dated 24-11-2015. The applicant argues that there is no disclosure with regard to that the session QoS manager 22 according to D1 determines the code rate based on a remaining time before reproduction start time and based on an available reproduction time. However, D1 discloses that the sender 20 uses the information provided from the receiver 50 to adjust the transmission rate and/or nominal playout rate of the different media to maintain the receiver buffer fullness level and/or perform “clock drift correction” (col. 7, l. 13-18). The different media QoS managers 22 can provide different rate adaptations for the different media types (col. 7, l. 18-20). In particular, D1 discloses the steps of providing to the server a message including information indicative of remaining playout duration in time (i.e. available reproduction time) in the receiver at a time instant and adjusting in the server the transmission rate and/or nominal playout rate at which the streaming data is provided to the client (col. 3, l. 25-36). The remaining playout duration in time is provided in form of an identity of a selected one of the sequence of packets to be played out and a time difference between a scheduled playout time (i.e. reproduction start

time) of said selected packet and a current time (i.e. remaining time). Consequently, the QoS manager 22 according to D1 determines the code rate based on a remaining time before reproduction start time (i.e. a time difference between a scheduled playout time and a current time) and an available reproduction time (i.e. remaining playout duration in time).

2.4 First Subject of the Present Application

Since the technical features of independent claims 1, 11, 16, 21, 22 and 26 of the present application are known (at least) from prior art D1, the first subject is defined by the special technical feature(s) of claims 2, 3, 12, 13, 18, 19, 23 and 24, namely that the code rate determining means is using time-value buffer and network statistics.

The objective problem underlying this provision can be formulated as:

ad I. How to ensure the timely reproduction of content? (claims 2, 3, 12, 13, 18, 19, 23 and 24)

2.5 Remaining Subjects of the Present Application

The special technical features of the other subjects of the present application are identified under items II and III in the listing above. The objective problems underlying these subjects can be formulated as follows:

ad II. How to configure the timing of the code rate determination? (claims 4, 14, 20 and 25)

ad III. How to synchronise a plurality of reception devices? (claims 5 and 15)

The technical features of subjects I-III are mutually exclusive as are the objective problems underlying them. Therefore, the requirement of unity is not met.

The applicant paid one additional search fee for claims 5-10 and 15 defining the invention or group of inventions covered by subject III which have consequently been covered by the supplementary European search report.

The applicant has not indicated on which searched invention the further prosecution of the application should be based (see the Guidelines for Examination C-III, 3.1.2). The applicant is asked to state upon which invention further

prosecution of this application should be based and to limit the application accordingly. Other inventions are to be excised from the claims, description and drawings if any.

The subject-matter to be excised may be made the subject of one or more divisional applications according to Rule 36 EPC.

3 Provisional Discussion of Group of Inventions

3.1 Objections under Articles 54(1) and (2)

As discussed in section 2.2, the subject-matter of independent claims 1, 11, 16, 21, 22 and 26 is not new within the meaning of Article 54(1) and (2) EPC, and the requirements of Article 52(1) EPC are therefore not met.

3.2 Provisional Discussion of First Subject (Claims 2, 3, 12, 13, 17-19, 23 and 24)

Dependent claims 2, 3, 12, 13, 17-19, 23 and 24 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the EPC with respect to inventive step.

The features of claim 17 are found in or derivable from D1. The features of claims 2, 3, 12, 13, 18, 19, 23 and 24 are considered in the light of D2. Below, all dependent claims are listed against the passages from D1 and D2 considered relevant:

Claims 2, 3, 12, 13, 18, 19, 23 and 24:	The subject-matter of the claims 2, 3, 12, 13, 18, 19, 23 and 24 differs from D1 in that the code rate determining means is using time-value buffer and network statistics. The objective technical problem to be solved by the present application may therefore be regarded as how to ensure the timely reproduction of content. The solution proposed in the claims 2, 3, 12, 13, 18, 19, 23 and 24 of the present application cannot be considered to involve an inventive step (Articles 52(1) and 56 EPC) for the following reasons: The skilled person, when confronted to this problem, would certainly look for documents that deal with congestion control for network transmissions. The skilled person would find document D2, which relates to a congestion controller for net-

work transmissions. The feature of adjusting the code rate using time-value buffer and network statistics is described in D2 as providing the same advantages as in the present application (par. 49-64; fig. 1-3). The skilled person would therefore regard it as a normal option to include this feature in the apparatus and method described in document D1 in order to solve the problem posed.

Claim 17: D1: p. 2, l. 50-57; p. 3, l. 25-36; p. 7, l. 1-22; fig. 3

3.3 Provisional Discussion of Third Subject (Claims 5-10 and 15)

Dependent claims 5-10 and 15 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the EPC with respect to inventive step.

The features of claims 5-10 and 15 are considered in the light of D3. Below, all dependent claims are listed against the passages from D3 considered relevant:

Claims 5 and 15: The subject-matter of the claims 5 and 15 differs from D1 in that a synchronous reproduction controlling means is used. The objective technical problem to be solved by the present application may therefore be regarded as how to synchronise a plurality of reception devices.
The solution proposed in the claims 5 and 15 of the present application cannot be considered to involve an inventive step (Articles 52(1) and 56 EPC) for the following reasons:
The skilled person, when confronted to this problem, would certainly look for documents that deal with multimedia synchronization techniques. The skilled person would find document D3, which relates to a comprehensive analysis and comparison of the most-known multimedia group and inter-stream synchronization approaches. The feature of using of synchronous reproduction controlling means is described in D3 as providing the same advantages as in the present application (group synchronization concept discussed in sections 3 and 4; fig. 3). The skilled person would therefore regard it

as a normal option to include this feature in the apparatus and method described in document D1 in order to solve the problem posed.

Claim 6: D3: sections 4.1 and 4.2.2
Reproduction start time setting means is considered in the light of D3.

Claim 7: The term *estimate a reproduction position ... to the second reception device* used in claim 7 is unclear and leaves the reader in doubt as to the meaning of the technical features to which it refers, thereby rendering the definition of the subject-matter of said claims unclear (Article 84 EPC). For the purpose of assessing inventive step this claim has been ignored.

Claims 8-10: D3: delay parameters described in p. 111 and 112; fig. 4
Setting the reproduction start time based on an each-device reproduction preparation time, an activation time and communication speed is considered in the light of D3.

4 Conclusions

Notwithstanding the objections under section 2, the present application does not meet the requirements of Article 52(1) EPC because the subject-matter of claims 1, 11, 16, 17, 21, 22 and 26 is not new (Article 54(1) and (2) EPC) and the subject-matter of claims 2, 3, 5-10, 12, 13, 15, 18, 19, 23 and 24 does not involve an inventive step within the meaning of Article 56 EPC.

5 Pursuit of the Application

5.1 The applicant is asked to state upon which invention further prosecution of this application should be based and to limit the application accordingly. Other inventions are to be excised from the claims, description and drawings if any. The subject-matter to be excised may be made the subject of one or more divisional applications according to Rule 36 EPC.

5.2 It is not clear what inventive/novel contribution has been made to the art by the present application. However, if the applicant can identify such a contribution and wishes to continue with the present application, he is invited to file a new set of claims directed towards such matter with suitable supporting arguments.

5.3 When revising the application, the applicant should also meet the following points:

5.3.1 New independent claims which set out clearly and concisely the inventive contribution should be presented in a number which satisfies the requirement of Rule 43(2) EPC;

5.3.2 The new claims should be divided in the appropriate two-part form, with a first portion correctly reflecting the nearest prior art disclosed by documents D1 and D2 (Rule 43(1)(a) and (b) EPC);

5.3.3 The opening part of the description should be brought into agreement with the claims as amended (Rule 42(1)(c) EPC).

5.3.4 The applicant is welcome to provide amended claims where added material is shown in underlined type and deleted material is shown in ~~strikeout~~ type. An additional "clean" version should then also be provided to facilitate any potential office-internal scanning/OCR and printing process.

5.4 In order to meet the requirements of Rule 137(4) EPC and to facilitate the examination of the conformity of the amended application with the requirements of Article 123(2) EPC, the applicant is requested to clearly identify the amendments carried out, irrespective of whether they concern amendments by addition, replacement or deletion, and to indicate the passages of the application as filed on which these amendments are based.

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Application No.	Ref.	Date
10 828 052.0 - 1905	NBA 038 WO/EP	21.12.2015
Applicant NEC Corporation		

Communication pursuant to Article 94(3) EPC

The examination of the above-identified application has revealed that it does not meet the requirements of the European Patent Convention for the reasons enclosed herewith. If the deficiencies indicated are not rectified the application may be refused pursuant to Article 97(2) EPC.

You are invited to file your observations and insofar as the deficiencies are such as to be rectifiable, to correct the indicated deficiencies within a period

of 2 months

from the notification of this communication, this period being computed in accordance with Rules 126(2) and 131(2) and (4) EPC. One set of amendments to the description, claims and drawings is to be filed within the said period on separate sheets (R. 50(1) EPC).

If filing amendments, you must identify them and indicate the basis for them in the application as filed. Failure to meet either requirement may lead to a communication from the Examining Division requesting that you correct this deficiency (R. 137(4) EPC).

Failure to comply with this invitation in due time will result in the application being deemed to be withdrawn (Art. 94(4) EPC).

Santos Conde, José
Primary Examiner
For the Examining Division

Enclosure(s): 8 page/s reasons (Form 2906)

Europäisches Patentamt
European Patent Office
Office européen des brevets

Application No.: 10828052.0

Substantive examination has started on 14.12.15 (see Notice from the European Patent Office dated 29.01.2013, OJ EPO 2013, 153).

For the Examining Division

Europäisches Patentamt
European Patent Office
Office européen des brevets

Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	3932623
Application number	EP10828052.0
Date of receipt	24 November 2015
Receiving Office	European Patent Office, The Hague
Your reference	NBA 038 WO/EP
Applicant	All applicants as on file
Documents submitted	package-data.xml epf1038.pdf (1 p.) ep-sfd-request.xml MEPA-01.pdf\nba038woep letter to EPO with enclosures.PDF (22 p.)
Submitted by	CN=Manuel Rodríguez Flórez 39716
Method of submission	Online
Date and time receipt generated	24 November 2015, 12:29 (CET)
Message Digest	1E:B0:C5:3E:B6:47:FF:37:86:52:EF:07:E0:91:FC:46:A7:1D:D8:BD

Correction by the EPO of errors in debit instructions filed by eOLF
Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

NEW CLAIMS

1. A distribution system (100), including a transmission device (110) and a reception device (120) configured to be capable of communicating with each other,

the transmission device (110) being equipped with a content transmitting means (111) for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device (120), and

the reception device (120) being equipped with a content reproducing means (121) for, while receiving the content data transmitted by the transmission device (110), storing received data of the content data into a storage device and also reproducing the content based on the stored data,

the distribution system, comprising a code rate determining means (131) for determining the code rate based on a remaining time before reproduction start time set as time at which the reception device (120) starts reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120), wherein:

the content transmitting means (111) is configured to change the code rate of the content data to be transmitted to the reception device (120) to the determined code rate; and

the content reproducing means (121) is configured to start reproduction of the content at the set reproduction start time.

2. The distribution system according to Claim 1, wherein the code rate determining means (131) is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

3. The distribution system according to Claim 2, wherein the code rate determining means (131) is configured to acquire a communication speed, which is a data amount

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of the content data transmitted from the transmission device (110) to the reception device (120) per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

4. The distribution system according to any of Claims 1 to 3, wherein the code rate determining means (131) is configured to determine the code rate with every change period set in advance.

5. The distribution system according to any of Claims 1 to 4, including a plurality of the reception devices (20a, 20b, 20c),

the distribution system, comprising a synchronous reproduction controlling means (32) for matching reproduction positions of the content to be reproduced by the plurality of the reception devices (20a, 20b, 20c), respectively, with each other among the plurality of the reception devices (20a, 20b, 20c).

6. The distribution system according to Claim 5, comprising a reproduction start time setting means (43) for setting the reproduction start time based on a target available reproduction time, which is a target value of the available reproduction time.

7. The distribution system according to Claim 5 or 6, wherein the content transmitting means (45) is configured to, when second reproduction start time, which is reproduction start time set for a second reception device as one of the plurality of the reception devices (20a, 20b, 20c), is later than first reproduction start time, which is reproduction start time set for a first reception device as another one of the plurality of the reception devices (20a, 20b, 20c), estimate a reproduction position of the content being reproduced by the first reception device at the second reproduction start time and transmit a portion of the content data at and after the estimated reproduction position to the second reception device.

8. The distribution system according to Claim 6 or 7, wherein the reproduction start time setting means (43) is configured to, for each reception device of the plurality of the reception devices (20a, 20b, 20c), calculate an each-device reproduction

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preparation time as a time required for the reception device (20a; 20b; 20c) to start reproduction of the content and set the reproduction start time based on a maximum value of the calculated each-device reproduction preparation time.

9. The distribution system according to any of Claims 6 to 8, wherein the reproduction start time setting means (43) is configured to set the reproduction start time based on an activation time, which is a time required for activation of an application program to be executed by the reception device (20a; 20b; 20c) for reproduction of the content, and the target available reproduction time.

10. The distribution system according to any of Claims 6 to 9, wherein the reproduction start time setting means (43) is configured to set the reproduction start time based on a communication speed, which is a data amount of the content data transmitted from the transmission device (10) to the reception device (20a; 20b; 20c) per unit time, and the target available reproduction time.

11. A distribution method applied to a distribution system including a transmission device and a reception device configured to be capable of communicating with each other, the distribution method comprising:

transmitting content data (S503), which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device, by the transmission device;

while receiving the content data transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data, by the reception device;

determining the code rate (S504) based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device;

changing the code rate (S505) of the content data to be transmitted to the reception device to the determined code rate, by the transmission device; and

starting reproduction of the content (S506) at the set reproduction start time, by the reception device.

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12. The distribution method according to Claim 11, comprising:

determining a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

13. The distribution method according to Claim 12, comprising:

acquiring a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time; and

determining a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

14. The distribution method according to any of Claims 11 to 13, comprising:

determining the code rate with every change period set in advance.

15. The distribution method according to any of Claims 11 to 14, applied to the distribution system including a plurality of the reception devices, the distribution method comprising:

matching reproduction positions of the content to be reproduced by the plurality of the reception devices, respectively, with each other among the plurality of the reception devices.

16. A transmission device (110) configured to be capable of communicating with a reception device (120), the transmission device (110) comprising:

a content transmitting means (111) for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device (120),

wherein the content transmitting means (111) is configured to change the code rate of the content data to be transmitted to the reception device (120) to a code rate determined based on a remaining time before reproduction start time set as time at which the reception device (120) starts reproduction of the content from a present

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moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120).

17. The transmission device (110) according to Claim 16, comprising:

a code rate determining means (131) for determining the code rate based on the remaining time and the available reproduction time.

18. The transmission device (110) according to Claim 16 or 17, wherein the code rate determining means (131) is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

19. The transmission device (110) according to Claim 18, wherein the code rate determining means (131) is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device (110) to the reception device per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

20. The transmission device (110) according to any of Claims 16 to 19, wherein the code rate determining means (131) is configured to determine the code rate with every change period set in advance.

21. A program comprising instructions for causing a transmission device (110) configured to be capable of communicating with a reception device (120) to realize a content transmitting means (111) for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device (120),

wherein the content transmitting means (111) is configured to change the code rate of the content data to be transmitted to the reception device (120) to a code rate determined based on a remaining time before reproduction start time set as time at

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which the reception device (120) starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120).

22. A reception device (120) configured to be capable of communicating with a transmission device (110), the reception device (120) comprising:

a content reproducing means (121) for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device (110), storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means (131) for determining the code rate based on a remaining time before reproduction start time set as time to start reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device,

wherein the content reproducing means (121) is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

23. The reception device (120) according to Claim 22, wherein the code rate determining means (131) is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

24. The reception device (120) according to Claim 23, wherein the code rate determining means (131) is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device (110) to the reception device (120) per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

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25. The reception device (120) according to any of Claims 22 to 24, wherein the code rate determining means (131) is configured to determine the code rate with every change period set in advance.

26. A program comprising instructions for causing a reception device (120) configured to be capable of communicating with a transmission device (110) to realize:

a content reproducing means (121) for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device (110), storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means (131) for determining the code rate based on a remaining time before reproduction start time set as time at which the reception device (120) starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120),

wherein the content reproducing means (121) is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

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NEW CLAIMS

1. A distribution system (100), including a transmission device (110) and a reception device (120) configured to be capable of communicating with each other,

the transmission device (110) being equipped with a content transmitting means (111) for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device (120), and

the reception device (120) being equipped with a content reproducing means (121) for, while receiving the content data transmitted by the transmission device (110), storing received data of the content data into a storage device and also reproducing the content based on the stored data,

the distribution system, comprising a code rate determining means (131) for determining the code rate based on a remaining time before reproduction start time set as time at which the reception device (120) starts reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120), wherein:

the content transmitting means (111) is configured to change the code rate of the content data to be transmitted to the reception device (120) to the determined code rate; and

the content reproducing means (121) is configured to start reproduction of the content at the set reproduction start time.

2. The distribution system according to Claim 1, wherein the code rate determining means (131) is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

3. The distribution system according to Claim 2, wherein the code rate determining means (131) is configured to acquire a communication speed, which is a data amount

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of the content data transmitted from the transmission device (110) to the reception device (120) per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

4. The distribution system according to any of Claims 1 to 3, wherein the code rate determining means (131) is configured to determine the code rate with every change period set in advance.

5. The distribution system according to any of Claims 1 to 4, including a plurality of the reception devices (20a, 20b, 20c),

the distribution system, comprising a synchronous reproduction controlling means (32) for matching reproduction positions of the content to be reproduced by the plurality of the reception devices (20a, 20b, 20c), respectively, with each other among the plurality of the reception devices (20a, 20b, 20c).

6. The distribution system according to Claim 5, comprising a reproduction start time setting means (43) for setting the reproduction start time based on a target available reproduction time, which is a target value of the available reproduction time.

7. The distribution system according to Claim 5 or 6, wherein the content transmitting means (45) is configured to, when second reproduction start time, which is reproduction start time set for a second reception device as one of the plurality of the reception devices (20a, 20b, 20c), is later than first reproduction start time, which is reproduction start time set for a first reception device as another one of the plurality of the reception devices (20a, 20b, 20c), estimate a reproduction position of the content being reproduced by the first reception device at the second reproduction start time and transmit a portion of the content data at and after the estimated reproduction position to the second reception device.

8. The distribution system according to Claim 6 or 7, wherein the reproduction start time setting means (43) is configured to, for each reception device of the plurality of the reception devices (20a, 20b, 20c), calculate an each-device reproduction

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preparation time as a time required for the reception device (20a; 20b; 20c) to start reproduction of the content and set the reproduction start time based on a maximum value of the calculated each-device reproduction preparation time.

9. The distribution system according to any of Claims 6 to 8, wherein the reproduction start time setting means (43) is configured to set the reproduction start time based on an activation time, which is a time required for activation of an application program to be executed by the reception device (20a; 20b; 20c) for reproduction of the content, and the target available reproduction time.

10. The distribution system according to any of Claims 6 to 9, wherein the reproduction start time setting means (43) is configured to set the reproduction start time based on a communication speed, which is a data amount of the content data transmitted from the transmission device (10) to the reception device (20a; 20b; 20c) per unit time, and the target available reproduction time.

11. A distribution method applied to a distribution system including a transmission device and a reception device configured to be capable of communicating with each other, the distribution method comprising:

transmitting content data (S503), which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device, by the transmission device;

while receiving the content data transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data, by the reception device;

determining the code rate (S504) based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device;

changing the code rate (S505) of the content data to be transmitted to the reception device to the determined code rate, by the transmission device; and

starting reproduction of the content (S506) at the set reproduction start time, by the reception device.

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12. The distribution method according to Claim 11, comprising:

determining a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

13. The distribution method according to Claim 12, comprising:

acquiring a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time; and

determining a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

14. The distribution method according to any of Claims 11 to 13, comprising:

determining the code rate with every change period set in advance.

15. The distribution method according to any of Claims 11 to 14, applied to the distribution system including a plurality of the reception devices, the distribution method comprising:

matching reproduction positions of the content to be reproduced by the plurality of the reception devices, respectively, with each other among the plurality of the reception devices.

16. A transmission device (110) configured to be capable of communicating with a reception device (120), the transmission device (110) comprising:

a content transmitting means (111) for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device (120),

wherein the content transmitting means (111) is configured to change the code rate of the content data to be transmitted to the reception device (120) to a code rate determined based on a remaining time before reproduction start time set as time at which the reception device (120) starts reproduction of the content from a present

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moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120).

17. The transmission device (110) according to Claim 16, comprising:

a code rate determining means (131) for determining the code rate based on the remaining time and the available reproduction time.

18. The transmission device (110) according to Claim 16 or 17, wherein the code rate determining means (131) is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

19. The transmission device (110) according to Claim 18, wherein the code rate determining means (131) is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device (110) to the reception device per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

20. The transmission device (110) according to any of Claims 16 to 19, wherein the code rate determining means (131) is configured to determine the code rate with every change period set in advance.

21. A program comprising instructions for causing a transmission device (110) configured to be capable of communicating with a reception device (120) to realize a content transmitting means (111) for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device (120),

wherein the content transmitting means (111) is configured to change the code rate of the content data to be transmitted to the reception device (120) to a code rate determined based on a remaining time before reproduction start time set as time at

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which the reception device (120) starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120).

22. A reception device (120) configured to be capable of communicating with a transmission device (110), the reception device (120) comprising:

a content reproducing means (121) for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device (110), storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means (131) for determining the code rate based on a remaining time before reproduction start time set as time to start reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device,

wherein the content reproducing means (121) is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

23. The reception device (120) according to Claim 22, wherein the code rate determining means (131) is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

24. The reception device (120) according to Claim 23, wherein the code rate determining means (131) is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device (110) to the reception device (120) per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

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25. The reception device (120) according to any of Claims 22 to 24, wherein the code rate determining means (131) is configured to determine the code rate with every change period set in advance.

26. A program comprising instructions for causing a reception device (120) configured to be capable of communicating with a transmission device (110) to realize:

a content reproducing means (121) for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device (110), storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means (131) for determining the code rate based on a remaining time before reproduction start time set as time at which the reception device (120) starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (120),

wherein the content reproducing means (121) is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

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reception devices synchronously reproduce content but also in a distribution system in which one reception device starts reproduction of content at set reproduction start time.

< insert description page 4a here >

SUMMARY

[0011]

Accordingly, an object of the present invention is to provide a distribution system capable of solving the abovementioned problems, "the code rate may be set to be extremely high" and "the reception device may be unable to start reproduce content at set reproduction start time."

[0012]

In order to achieve the object, a distribution system of an exemplary embodiment of the present invention is a system including a transmission device and a reception device configured to be capable of communicating with each other.

The transmission device is equipped with a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device.

The reception device is equipped with a content reproducing means for, while receiving the content data transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data.

The distribution system comprises a code rate determining means for determining the code rate based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an

US 7 606 928 B2 relates to a method for providing to a sender of RTP packets the actual receiver buffer fullness level in a receiver of the RTP packets at a certain time instant represented as remaining playout duration in time. The receiver sends in an RTCP report the sequence number of a selected RTP packet in the receiver buffer and the time difference between the scheduled playout time of this packet and the current time. Based on this timing information, the sender calculates the amount of time it would take for the receiver buffer to empty if the receiver continues to playout at normal speed and no further RTP packets arrive to the receiver buffer. This receiver buffer fullness level information can be used at the sender to adjust the transmission rate and/or nominal playout rate of the RTP packets in order to maintain a targeted receiver buffer fullness level.

US 2007/133405 A1 relates to a congestion controller for a media server, which monitors both the buffer status of the client device as well as the network performance. The congestion controller may increase or decrease the pacing of packets transmitted over the network based on the fullness of a buffer on the client device, but may also change the bit rate of the packets based on the network performance. By monitoring both the client device status and network performance, the pacing and bit rate of the packets may be varied together to achieve an optimized throughput and maximized user experience of the media.

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European Patent Office
80298 Munich

November 24, 2015

European Patent Application 10828052.0
"Distribution system"
NEC Corporation
Our File: NBA 038 WO/EP S/MG

In response to the extended European search report dated June 9, 2015, and the communication pursuant to Rules 70(2) and 70a(2) EPC dated June 26, 2015.

The applicant herewith indicates to proceed further with the above-identified European patent application.

For proceeding further the applicant herewith respectfully submits new claims 1 to 26 which are to replace the claims as originally filed and on which the substantive examination is to be based. Furthermore, a replacement description page 4 which is to replace the respective description page as originally filed, and a new description page 4a are herewith submitted.

The new claims correspond to the original claims. That is, the subject-matter originally claimed is maintained. However, the features of the new claims have been provided with reference signs placed in

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parentheses to increase their intelligibility in accordance with the requirements of Rule 43(7) EPC.

In section 1, it is alleged that the application lacks unity within the meaning of Article 82 EPC *a posteriori*, that is, when considering the disclosure of cited document D1.

This allegation however is respectfully traversed because the subject-matter of new (original) claim 1 is novel and involves an inventive step over the prior art on hand, in particular cited document D1. This will be detailed below.

New (original) claim 1 directed to a distribution system including a transmission device and a reception device comprises, *inter alia*, a code rate determining means for determining the code rate based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment and based on an available reproduction time which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

In item 1.2, it is alleged that the session QoS manager 22 according to D1 corresponds to the code rate determining means according to the present invention.

However, at least in the passages to which it is referred to in item 1.2, there is no disclosure with regard to that the session QoS manager 22 according to D1 determines the code rate based on a remaining time before reproduction start time and based on an available reproduction time.

In particular, D1 discloses at column 3, lines 25 to 36, the step of providing to the server a message including information indicative of remaining playout duration in time in the receiver at a time instant, wherein the remaining playout duration in time is provided in form of an identity of a selected one of the sequence of packets to be played out and a time difference between a scheduled playout time of said selected

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packet and a current time. That is, D1 at best describes a current time and a remaining playout duration in time. However, unlike the present invention, D1 does not disclose remaining time before reproduction start time.

In this regard, it is respectfully noted that current time according to D1 cannot be considered as corresponding to the remaining time as defined in new claim 1 because current time is a particular time point whereas remaining time is a duration of time.

Moreover, D1 discloses to adjust the transmission rate and/or nominal playout rate taking into account the remaining playout duration in time (see column 2, line 50 through column 3, line 59). Since the remaining playout duration in time is disclosed as to be provided in form of an identity of a selected one of the sequence of packets to be played out and a time difference between a scheduled playout time of the selected packet and a current time, the adjustment can at best be considered as being made considering the identity of the selected packet and the time difference. However, there is no disclosure in D1 with regard to that the transmission rate and/or the nominal playout rate is determined and/or adjusted based on a remaining time before reproduction start time and based on an available reproduction time.

Accordingly, the subject-matter of new claim 1 differs with regard to the code rate determining means from D1.

As apparently has already been acknowledged by the Examiner, none of the other cited documents D2 and D3 provides disclosure with regard to the combination of features as recited in new (original) claim 1. Indeed, none of said documents at least provides disclosure with regard to a code rate determining means for determining the code rate based on a remaining time before reproduction start time and based on an available reproduction time.

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Accordingly, the subject-matter of new claim 1 is novel over the prior art on hand in accordance with Article 54(1) and (2) EPC.

For assessing an inventive step D1 is deemed as the closest prior art.

As already discussed above, D1 does not disclose a code rate determining means for determining the code rate based on a remaining time before reproduction start time and based on an available reproduction time, as recited in new claim 1.

Accordingly, the code rate can be determined and thus adjusted based on both a remaining time and an available reproduction time. The code rate can therefore be set to a relatively large value in a case that the available reproduction time is relatively short and the remaining time is considerably long. As a result, it is possible to avoid meaninglessly lowering the code rate (see e.g. paragraph [0156]). Furthermore, the code rate can be set to a relatively small value in a case that the available reproduction time is relatively long and the remaining time is considerably short. As a result, it is possible to secure a sufficiently large available reproduction time at reproduction start time so as to ensure that the reception device can securely start reproduction of the content at the reproduction start time (see e.g. paragraph [0157]). In short, it is possible to cause the reception device to securely start reproduction of the content at the reproduction start time while avoiding meaninglessly lowering the code rate (see e.g. paragraph [0158]).

The problem underlying the present invention may therefore be formulated to provide a distribution system including a transmission device and a reception device with which it is possible to cause the reception device to securely start reproduction of the content transmitted by the transmission device at the reproduction start time while avoiding meaninglessly lowering the code rate of the content transmitted.

D1 does not provide disclosure, teaching or suggestion with regard to the above-mentioned (distinguishing) features and/or any other solution for the problem derived.

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The skilled person would not take into consideration a combination of D1 with one or more of the other cited documents when being prompted with the problem derived because none of these documents provides disclosure, teaching or suggestion with regard to the distinguishing features or any other solution for the problem derived. The distinguishing features are therefore regarded as being not rendered obvious.

The subject-matter of new claim 1 therefore is to be regarded as involving an inventive step in accordance with Article 56 EPC.

Since new (original) claims 11, 16, 21, 22, and 26 all comprise features corresponding to those of new claim 1, the above applies *mutatis mutandis*.

As it has been shown above, the subject-matter of the new (original) independent claims is novel and involves an inventive step over the prior art on hand, in particular D1. Hence, the lack of unity objection set forth in section 1 is not justified. It is therefore respectfully requested to withdraw the objection raised and acknowledge that the subject-matter of all new (original) claims is comprised by the search.

Since the EPO has been allowed with letter of March 26, 2015 in response to the communication pursuant to Rule 161(1) EPC dated February 4, 2015 to debit one further search fee, and since as shown above the objection regarding lack of unity *a posteriori* and the corresponding communication pursuant to Rule 161(1) EPC was not justified, it is respectfully requested in accordance with Rule 164(5) EPC to refund the further search fee.

In order to comply with the requirements of Rule 42(1) EPC, cited documents D1 and D2 have been indicated in the introductory part of the description.

The new independent claims however have not been cast into the two-part form for the following reason. Due to the indication of the cited documents it is derivable for

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the skilled person which of the features defined are known in combination therefrom and which of the remaining features are necessary for the definition of the present invention. It therefore is respectfully requested to not insist upon the two-part form (see Guidelines for Examination in the EPO, F-IV, 2.3.2).

The applicant is therefore of the opinion that all objections raised in the communication have been addressed and should be overcome with the newly submitted documents. It therefore is respectfully requested to acknowledge patentability.

Only as a precaution it is requested not to issue a negative decision without having issued a further office action or having given to the applicant the opportunity for an informal interview or, auxiliarily only, oral proceedings.

Franz-Josef Schöniger

Enclosures
New claims 1 to 26 (annotated and clean copy)
Replacement description page 4
New description page 4a

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Europäisches Patentamt
European Patent Office
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Letter accompanying subsequently filed items

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	10828052.0
Applicant's or representative's reference	NBA 038 WO/EP

	Description of document	Original file name	Assigned file name
1	Maintenance of the application	nba038woep letter to EPO with enclosures.PDF	MEPA-01.pdf

	Payment	
1	Mode of payment	Automatic debit order
	Currency:	EUR
	The European Patent Office is hereby authorised, under the Arrangements for the automatic debiting procedure, to debit from the deposit account any fees and costs falling due.	
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Signatures

Place:	**Munich**
Date:	**24 November 2015**
Signed by:	**Manuel Rodríguez Flórez 39716**
Association:	**BETTEN & RESCH Patent- und Rechtsanwälte PartGmbB**
Representative name:	**Franz-Josef Schöniger**
Capacity:	**(Representative)**

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Europäisches Patentamt
Dir. 523
Rechtsabteilung
z. H. Frau Gabriella Beyer
80298 München

11. November 2015

Zusammenschluss Nr. 103

Sehr geehrte Frau Beyer,

ab dem 9. November 2015 lautet die Adresse unserer Kanzlei wie folgt:

Maximiliansplatz 14
80333 München

Postfach, Telefon- und Telefaxnummer sowie E-Mail bleiben unverändert.

Mit freundlichen Grüßen

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European Design Attorneys

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Duration: 11.11.2015 12:51:31 - 11.11.2015 12:52:12. This page 1 of 1 was completed at 11.11.2015 12:52:12
Received at the EPO on Nov 11, 2015 12:52:12. Page 1 of 1

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GERMANY

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80333 München
ALLEMAGNE

Date
26.06.15

Reference	Application No./Patent No.
NBA 038 WO/EP	10828052.0 - 1905 / 2498492 PCT/JP2010006067
Applicant/Proprietor	
NEC Corporation	

Communication pursuant to Rules 70(2) and 70a(2) EPC

A supplementary European search report has been drawn up concerning the above-identified European patent application (publication number: 2498492).

Since the request for examination has been filed (R. 70(1), 159(1)(f), Art. 94(1) EPC) prior to the transmission of the supplementary European search report, you are hereby invited to indicate within

six months

of notification of this communication whether you wish to proceed further with the European patent application.

If you do not indicate in due time that you wish to proceed further with the European patent application, it **will be deemed to be withdrawn** (R. 70(3) EPC).

You are invited, within the above-mentioned six-month period, to comment on the objections raised in the opinion accompanying the European search report and/or to file any amendments to the description, claims and drawings correcting any deficiencies noted in the opinion (R. 70a(2), R. 137(2) EPC; Guidelines for Examination in the EPO, B-XI, 8).

If filing amendments, you must identify them and indicate the basis for them in the application as filed. Failure to meet either requirement may lead to a communication from the Examining Division requesting that you correct this deficiency (R. 137(4) EPC).

Should the reply to the invitation pursuant to Rule 70a(2) EPC be filed in an admissible non-EPO language, a translation is to be submitted within one month of its filing (R. 6(2) EPC).

Should you not comply with this invitation within the time limit, the application **will be deemed to be withdrawn** in accordance with Rule 70a(3) EPC.

Receiving Section

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Registered letter
EPO Form 1224 11.12 (RTB/ESOP01=N) DMEX

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European Patent Office
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10828052.0 - 1905 / 2498492 16.06.15

Client Database System (CDS) - clean up.

Application Nr.: 10828052.0

Following clean up action in CDS the entries concerning the **Representative for the applicant (association)** have been amended and are now as follows:

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DE

Where appropriate, the European Patent Register at www.epo.org/register will be updated to show the amended details.

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Questions about this communication ?
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Betten & Resch
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Date
09.06.15

Reference	Application No./Patent No.
NBA 038 WO/EP	10828052.0 - 1905 / 2498492 PCT/JP2010006067
Applicant/Proprietor	
NEC Corporation	

Communication

The extended European search report is enclosed.

The extended European search report includes, pursuant to Rule 62 EPC, the supplementary European search report (Art. 153(7) EPC) and the European search opinion.

Copies of documents cited in the European search report are attached.

☑ 1 additional set(s) of copies of such documents is (are) enclosed as well.

Refund of the search fee
If applicable under Article 9 Rules relating to fees, a separate communication from the Receiving Section on the refund of the search fee will be sent later.

Should you wish to further prosecute this application in the examination phase, your attention is drawn to the provisions of Rule 70a EPC. An invitation to respond to the extended European search report will be issued shortly (R. 70(2) EPC).

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The examination is being carried out on the **following application documents**

Description, Pages

1-58 as published

Claims, Numbers

1-26 as published

Drawings, Sheets

1/14-14/14 as published

Reference is made to the following documents; the numbering will be adhered to in the rest of the procedure.

D1 US 7 606 928 B2 (WANG RU-SHANG [US] ET AL)
20 October 2009 (2009-10-20)

D2 US 2007/133405 A1 (BOWRA TODD [US] ET AL)
14 June 2007 (2007-06-14)

D3 BORONAT F ET AL: "Multimedia group and inter-stream synchronization techniques: A comparative study",
INFORMATION SYSTEMS, PERGAMON PRESS, OXFORD, GB,
vol. 34, no. 1, 1 March 2009 (2009-03-01), pages 108-131,
XP025644936,
ISSN: 0306-4379, DOI: 10.1016/J.IS.2008.05.001
[retrieved on 2008-05-24]

1 Non-Unity

The application lacks unity within the meaning of Article 82 EPC, for the following reasons:

1.1 Group of Inventions

The following separate inventions or groups of inventions are not linked as to form a single general inventive concept:

I. Claims: 1-3, 11-13, 16-19, 21-24 and 26
Code rate determining means using time-value buffer and network statistics

II. Claims: 4, 14, 20 and 25
Details regarding the timing of the code rate determination

III. Claims: 5-10 and 15
Use of a synchronous reproduction controlling means

1.2 Prior Art

Seen in the light of the first claim of the present application, document D1 describes (while repeating the wording of claim 1, the references in parentheses apply to this document):
A distribution system (multimedia streaming system 10 in fig. 3)*, including a transmission device* (sender 20 in fig. 3) *and a reception device* (receiver 50 in fig. 3) *configured to be capable of communicating with each other* (p. 6, l. 58 - p. 7, l. 22; fig. 3)*,*

- *the transmission device being equipped with a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device* (p. 6, l. 58 - p. 7, l. 22; fig. 3)*, and*
- *the reception device being equipped with a content reproducing means* (decoder/player 52 in fig. 3) *for, while receiving the content data transmitted by the transmission device* (RTP/RTCP module 56 in fig. 3)*, storing received data of the content data into a storage device* (receiver buffer 54 in fig. 3) *and also reproducing the content based on the stored data* (p. 6, l. 62-67; fig. 3)*,*

- *the distribution system, comprising a code rate determining means* (session QoS manager 22 in fig. 3) *for determining the code rate based on a remaining time* (current time) *before reproduction start time* (scheduled playout time) *set as time at which the reception device starts reproduction of the content from a present moment and based on an available reproduction time* (remaining playout duration time)*, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device* (p. 2, l. 50-57; p. 3, l. 25-36; p. 7, l. 1-22; fig. 3)*, wherein:*
- *the content transmitting means is configured to change the code rate of the content data to be transmitted to the reception device to the determined code rate* (p. 6, l. 67 - p. 7, l. 22)*; and*
- *the content reproducing means is configured to start reproduction of the content at the set reproduction start time* (p. 2, l. 50-57)*.*

Thus, the subject-matter of claim 1 is not new over the disclosure of D1. The same reasoning applies, mutatis mutandis, to the subject-matter of the corresponding independent claims 11, 16, 21, 22 and 26.

1.3 First Subject of the Present Application

Since the technical features of independent claims 1, 11, 16, 21, 22 and 26 of the present application are known (at least) from prior art D1, the first subject is defined by the special technical feature(s) of claims 2, 3, 12, 13, 18, 19, 23 and 24, namely that the code rate determining means is using time-value buffer and network statistics.

The objective problem underlying this provision can be formulated as:

ad I. How to ensure the timely reproduction of content? (claims 2, 3, 12, 13, 18, 19, 23 and 24)

1.4 Remaining Subjects of the Present Application

The special technical features of the other subjects of the present application are identified under items II and III in the listing above. The objective problems underlying these subjects can be formulated as follows:

ad II. How to configure the timing of the code rate determination? (claims 4, 14, 20 and 25)

ad III. How to synchronise a plurality of reception devices? (claims 5 and 15)

The technical features of subjects I-III are mutually exclusive as are the objective problems underlying them. Therefore, the requirement of unity is not met.

The applicant paid one additional search fee for claims 5-10 and 15 defining the invention or group of inventions covered by subject III which have consequently been covered by the supplementary European search report.

The applicant has not indicated on which searched invention the further prosecution of the application should be based (see the Guidelines for Examination C-III, 3.1.2). The applicant is asked to state upon which invention further prosecution of this application should be based and to limit the application accordingly. Other inventions are to be excised from the claims, description and drawings if any.

The subject-matter to be excised may be made the subject of one or more divisional applications according to Rule 36 EPC.

2 Discussion of Group of Inventions

2.1 Objections under Articles 54(1) and (2)

As discussed in section 1.2, the subject-matter of independent claims 1, 11, 16, 21, 22 and 26 is not new within the meaning of Article 54(1) and (2) EPC, and the requirements of Article 52(1) EPC are therefore not met.

2.2 Discussion of First Subject (Claims 2, 3, 12, 13, 17-19, 23 and 24)

Dependent claims 2, 3, 12, 13, 17-19, 23 and 24 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the EPC with respect to inventive step.

The features of claim 17 are found in or derivable from D1. The features of claims 2, 3, 12, 13, 18, 19, 23 and 24 are considered in the light of D2. Below, all dependent claims are listed against the passages from D1 and D2 considered relevant:

Claims 2, 3, 12, 13, 18, 19, 23 and 24:

The subject-matter of the claims 2, 3, 12, 13, 18, 19, 23 and 24 differs from D1 in that the code rate determining means is using time-value buffer and network statistics.
The objective technical problem to be solved by the present application may therefore be regarded as how to ensure the timely reproduction of content.
The solution proposed in the claims 2, 3, 12, 13, 18, 19, 23 and 24 of the present application cannot be considered to involve an inventive step (Articles 52(1) and 56 EPC) for the following reasons:
The skilled person, when confronted to this problem, would certainly look for documents that deal with congestion control for network transmissions. The skilled person would find document D2, which relates to a congestion controller for network transmissions. The feature of adjusting the code rate using time-value buffer and network statistics is described in D2 as providing the same advantages as in the present application (par. 49-64; fig. 1-3). The skilled person would therefore regard it as a normal option to include this feature in the apparatus and method described in document D1 in order to solve the problem posed.

Claim 17: D1: p. 2, l. 50-57; p. 3, l. 25-36; p. 7, l. 1-22; fig. 3

2.3 Discussion of Third Subject (Claims 5-10 and 15)

Dependent claims 5-10 and 15 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the EPC with respect to inventive step.

The features of claims 5-10 and 15 are considered in the light of D3. Below, all dependent claims are listed against the passages from D3 considered relevant:

Claims 5 and 15:

The subject-matter of the claims 5 and 15 differs from D1 in that a synchronous reproduction controlling means is used.
The objective technical problem to be solved by the present application may therefore be regarded as how to synchronise a plurality of reception devices.
The solution proposed in the claims 5 and 15 of the present

application cannot be considered to involve an inventive step (Articles 52(1) and 56 EPC) for the following reasons:
The skilled person, when confronted to this problem, would certainly look for documents that deal with multimedia synchronization techniques. The skilled person would find document D3, which relates to a comprehensive analysis and comparison of the most-known multimedia group and inter-stream synchronization approaches. The feature of using of synchronous reproduction controlling means is described in D3 as providing the same advantages as in the present application (group synchronization concept discussed in sections 3 and 4; fig. 3). The skilled person would therefore regard it as a normal option to include this feature in the apparatus and method described in document D1 in order to solve the problem posed.

Claim 6: D3: sections 4.1 and 4.2.2
Reproduction start time setting means is considered in the light of D3.

Claim 7: The term *estimate a reproduction position ... to the second reception device* used in claim 7 is unclear and leaves the reader in doubt as to the meaning of the technical features to which it refers, thereby rendering the definition of the subject-matter of said claims unclear (Article 84 EPC). For the purpose of assessing inventive step this claim has been ignored.

Claims 8-10: D3: delay parameters described in p. 111 and 112; fig. 4
Setting the reproduction start time based on an each-device reproduction preparation time, an activation time and communication speed is considered in the light of D3.

3 Conclusions

In conclusion, the present application does not meet the requirements of Article 52(1) EPC because the subject-matter of claims 1, 11, 16, 17, 21, 22 and 26 is not new (Article 54(1) and (2) EPC) and the subject-matter of claims 2, 3, 5-10, 12, 13, 15, 18, 19, 23 and 24 does not involve an inventive step within the meaning of Article 56 EPC.

Peloton - EX1005, Page 263
IPR2023-01239 (Peloton v. NEC)

4 Pursuit of the Application

4.1 It is not clear what inventive/novel contribution has been made to the art by the present application. However, if the applicant can identify such a contribution and wishes to continue with the present application, he is invited to file a new set of claims directed towards such matter with suitable supporting arguments.

5 When revising the application, the applicant should also meet the following points:

5.1.1 New independent claims which set out clearly and concisely the inventive contribution should be presented in a number which satisfies the requirement of Rule 43(2) EPC;

5.1.2 The new claims should be divided in the appropriate two-part form, with a first portion correctly reflecting the nearest prior art disclosed by documents D1 and D2 (Rule 43(1)(a) and (b) EPC);

5.1.3 The features of the claims should be provided with reference signs placed in parentheses to increase the intelligibility of the claims (Rule 43(7) EPC). This applies to both the preamble and characterising portion (see the Guidelines for Examination, F-IV 4.19).

5.1.4 To meet the requirements of Rule 42(1)(b) EPC, documents D1 and D2 should be identified in the description and the relevant background art disclosed therein should be briefly discussed.

5.1.5 The opening part of the description should be brought into agreement with the claims as amended (Rule 42(1)(c) EPC).

5.1.6 The applicant is welcome to provide amended claims where added material is shown in underlined type and deleted material is shown in ~~strikeout~~ type. An additional "clean" version should then also be provided to facilitate any potential office-internal scanning/OCR and printing process.

5.2 In order to meet the requirements of Rule 137(4) EPC and to facilitate the examination of the conformity of the amended application with the requirements of Article 123(2) EPC, the applicant is requested to clearly identify the amendments carried out, irrespective of whether they concern amendments by addition, replacement or deletion, and to indicate the passages of the application as filed on which these amendments are based.

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SUPPLEMENTARY EUROPEAN SEARCH REPORT

Application Number
EP 10 82 8052

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	US 7 606 928 B2 (WANG RU-SHANG [US] ET AL) 20 October 2009 (2009-10-20) * column 2 - column 7; figure 3 *	1,11,16, 17,21, 22,26 2,3, 5-10,12, 13,15, 18,19, 23,24	INV. H04N21/234 H04N21/262 H04N21/433 H04N21/6379
Y	US 2007/133405 A1 (BOWRA TODD [US] ET AL) 14 June 2007 (2007-06-14) * paragraph [0049] - paragraph [0064]; figures 1-3 *	2,3,12, 13,18, 19,23,24	
Y	BORONAT F ET AL: "Multimedia group and inter-stream synchronization techniques: A comparative study", INFORMATION SYSTEMS, PERGAMON PRESS, OXFORD, GB, vol. 34, no. 1, 1 March 2009 (2009-03-01), pages 108-131, XP025644936, ISSN: 0306-4379, DOI: 10.1016/J.IS.2008.05.001 [retrieved on 2008-05-24] * page 108 - page 123; figures 3,4; tables 1,2 *	5-10,15	

TECHNICAL FIELDS SEARCHED (IPC)
H04N

The supplementary search report has been based on the last set of claims valid and available at the start of the search.

Place of search	Date of completion of the search	Examiner
The Hague	1 June 2015	Santos Conde, José

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

3

EPO FORM 1503 03.82 (P04C04)

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Application Number
EP 10 82 8052

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present (supplementary) European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☒ Only part of the further search fees have been paid within the fixed time limit. The present (supplementary) European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

1-3, 5-13, 15-19, 21-24, 26

☐ None of the further search fees have been paid within the fixed time limit. The present (supplementary) European search report has been drawn up for those parts of the European patent application which relate to the first mentioned in the claims, namely claims:

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 10 82 8052

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-3, 11-13, 16-19, 21-24, 26

   Code rate determining means using time-value buffer and network statistics

   ---

2. claims: 4, 14, 20, 25

   Details regarding the timing of the code rate determination

   ---

3. claims: 5-10, 15

   Use of a synchronous reproduction controlling means

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 82 8052

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

01-06-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7606928 B2	20-10-2009	AT 505891 T	15-04-2011
		BR PI0408566 A	21-03-2006
		CA 2517194 A1	30-09-2004
		CN 1791872 A	21-06-2006
		EP 1606717 A2	21-12-2005
		JP 4430660 B2	10-03-2010
		JP 2006521035 A	14-09-2006
		KR 20060024351 A	16-03-2006
		MY 141951 A	30-07-2010
		TW I242957 B	01-11-2005
		US 2004186877 A1	23-09-2004
		WO 2004083992 A2	30-09-2004
US 2007133405 A1	14-06-2007	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

BETTEN & RESCH

FAX

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European Patent Office
80298 Munich

March 26, 2015

European Patent Application 10828052.0
"Distribution system"
NEC Corporation
Our File: NBA 038 WO/EP S/RF

In response to the Communication pursuant to Rule 164(1) EPC dated February 4, 2015.

The EPO is herewith requested to debit **1 further search fee** in connection with the supplementary partial European search report dated January 27, 2015.

Therefore, the invention or group of inventions that in the Examiner's view is covered by **group 3** of the claims, i. e., claims 5-10 and 15, is also to be searched.

With regard to group 2 of the claims, i.e., claims 4, 14, 20, 25, the applicant does <u>not</u> wish to pay any additional search fee and therefore the invention or group of inventions covered in the Examiner's view by group 2 of the claims is <u>not</u> to be searched.

Patentanwälte
European Patent Attorneys
European Trademark Attorneys
European Design Attorneys

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Duration: 26.03.2015 15:59:22 - 26.03.2015 15:59:33. This page 1 of 2 was completed at 26.03.2015 15:59:29
Received at the EPO on Mar 26, 2015 15:59:33. Page 1 of 2

BETTEN & RESCH

To this end, we refer to the automatic debit order for this application. In case no automatic debit order is effective for this application, the fees (total: 1.285 €) may be debited from our deposit account No. 28000531.

Franz-Josef Schöniger

Peloton - EX1005, Page 270
IPR2023-01239 (Peloton v. NEC)
Duration: 26.03.2015 15:59:22 - 26.03.2015 15:59:33. This page 2 of 2 was completed at 26.03.2015 15:59:33
Received at the EPO on Mar 26, 2015 15:59:33. Page 2 of 2

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Date
04.02.15

Reference	Application No./Patent No.
NBA 038 WO/EP	10828052.0 - 1905 / 2498492 PCT/JP2010006067
Applicant/Proprietor	
NEC Corporation	

Communication pursuant to Rule 164(1) EPC

The partial supplementary European search report (R. 164 EPC) is enclosed.

The applicant is informed that if the supplementary European search report is also to cover inventions other than the invention(s) already searched and for which a meaningful search can be carried out, a further search fee must be paid for each of these inventions, in the present instance

2 search fee(s)

within **two months** from the date of notification of this communication.

The amount payable for each further search is EUR 1285,00.

Note to users of the automatic debiting procedure
Unless the EPO receives prior instructions to the contrary, a seach fee for (each of) the identified invention(s) will be debited on the last day of the period for payment. See the Arrangements for the automatic debiting procedure (Supplementary publication 4 - OJ EPO 2014).

If applicable, a European search opinion covering those invention(s) for which a search fee has been paid will then be sent together with the supplementary European search report.

Copies of documents cited in the supplementary European search report are attached.

☑ 1 additional set(s) of copies of such documents is (are) enclosed as well.

Important information concerning fee amounts
Following any amendment to the Rules relating to Fees, the amount(s) mentioned in this communication may be different from the amount(s) **actually due on the date of payment.** The latest version of the Schedule of fees and expenses, published as a Supplement to the Official Journal of the EPO, is also available on the EPO website (**www.epo.org**) and can be found under **www.epo.org/schedule-of-fees**, which allows the viewing, downloading and searching for individual fee amounts, both current and previous.
Please note that procedural fees are usually adjusted every two years, on even years, with effect from 1 April.

Payments by cheque delivered or sent direct to the EPO are no longer accepted as from 1 April 2008 (see OJ EPO 2007, 626).



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SUPPLEMENTARY PARTIAL EUROPEAN SEARCH REPORT

under Rule 164, paragraph 1 of the European Patent Convention

Application Number
EP 10 82 8052

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 7 606 928 B2 (WANG RU-SHANG [US] ET AL) 20 October 2009 (2009-10-20)	1,11,16, 17,21, 22,26	INV. H04N21/234 H04N21/262 H04N21/433 H04N21/6379
Y	* column 2 - column 7; figure 3 *	2,3,12, 13,18, 19,23,24	

Y	US 2007/133405 A1 (BOWRA TODD [US] ET AL) 14 June 2007 (2007-06-14)	2,3,12, 13,18, 19,23,24	
	* paragraph [0049] - paragraph [0064]; figures 1-3 *		

TECHNICAL FIELDS SEARCHED (IPC)

H04N

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

The present partial supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims.

1

Place of search	Date of completion of the search	Examiner
The Hague	27 January 2015	Santos Conde, José

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04N23)

Europäisches Patentamt
European Patent Office
Office européen des brevets

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 10 82 8052

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-3, 11-13, 16-19, 21-24, 26

The distribution system comprising a code rate determining means

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2. claims: 4, 14, 20, 25

Details regarding the timing of the code rate determination

---

3. claims: 5-10, 15

Use of a synchronous reproduction controlling means

The search has been limited to the first subject.

1 Non-Unity
The application lacks unity within the meaning of Article 82 EPC, for the following reasons:
1.1 The following separate inventions or groups of inventions are not linked as to form a single general inventive concept:
1. Claims: 1-3, 11-13, 16-19, 21-24 and 26
The distribution system comprising a code rate determining means
2. Claims: 4, 14, 20 and 25
Details regarding the timing of the code rate determination
3. Claims: 5-10 and 15
Use of a synchronous reproduction controlling means

1.1 PRIOR ART
Seen in the light of the first claim of the present application, document D1 describes (while repeating the wording of claim 1, the references in parentheses apply to this document):
A distribution system (multimedia streaming system 10 in fig. 3), including a transmission device (sender 20 in fig. 3)and a reception device (receiver 50 in fig. 3)configured to be capable of communicating with each other (p. 6, l. 58 - p. 7, l. 22; fig. 3),
the transmission device being equipped with a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device (p. 6, l. 58 - p. 7, l. 22; fig. 3)- , and
the reception device being equipped with a content reproducing means (decoder/player 52 in fig. 3)for, while receiving the content data transmitted by the transmission device (RTP/RTCP module 56 in fig. 3), storing received data of the content data into a storage device (receiver buffer 54 in fig. 3)and also reproducing the content based on the stored data (p. 6, l. 62-67; fig. 3)- ,
the distribution system, comprising a code rate determining means (session QoS manager 22 in fig. 3)for determining the code rate based on a remaining time (current time)before reproduction start time (scheduled

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IPR2023-01239 (Peloton v. NEC)

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

playout time)set as time at which the reception device starts reproduction of the content from a present moment and based on an available reproduction time (remaining playout duration time), which is a time available for reproducing the content based on the content data stored in the storage device of the reception device (p. 2, l. 50-57; p. 3, l. 25-36; p. 7, l. 1-22; fig. 3)- , wherein:
the content transmitting means is configured to change the code rate of the content data to be transmitted to the reception device to the determined code rate (p. 6, l. 67 - p. 7, l. 22)- ; and
the content reproducing means is configured to start reproduction of the content at the set reproduction start time (p. 2, l. 50-57)- .

Thus, the subject-matter of claim 1 is not new over the disclosure of D1.
1.1 FIRST SUBJECT OF THE PRESENT APPLICATION
Since the technical features of claim 1 of the present application are known (at least) from prior art D1, the first subject is defined by the special technical feature(s) of claims 1-3, 11-13, 16-19, 21-24 and 26, namely that distribution system comprises a code rate determining means.
The objective problem underlying this provision can be formulated as:
ad I. How to ensure the timely reproduction of content?
1.1 REMAINING SUBJECTS OF THE PRESENT APPLICATION
The special technical features of the other subjects of the present application are identified under items II and III in the listing above.
The objective problems underlying these subjects can be formulated as follows:
ad II. How to configure the timing of the code rate determination?
ad III. How to synchronise a plurality of reception devices?
The technical features of subjects I-III are mutually exclusive as are the objective problems underlying them. Therefore, the requirement of unity is not met and in the following, only the first subject (claims 1-3, 11-13, 16-19, 21-24 and 26) is discussed.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 82 8052

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

27-01-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7606928 B2	20-10-2009	AT 505891 T	15-04-2011
		BR PI0408566 A	21-03-2006
		CA 2517194 A1	30-09-2004
		CN 1791872 A	21-06-2006
		EP 1606717 A2	21-12-2005
		JP 4430660 B2	10-03-2010
		JP 2006521035 A	14-09-2006
		KR 20060024351 A	16-03-2006
		MY 141951 A	30-07-2010
		TW I242957 B	01-11-2005
		US 2004186877 A1	23-09-2004
		WO 2004083992 A2	30-09-2004
US 2007133405 A1	14-06-2007	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

Europäisches Patentamt
European Patent Office
Office européen des brevets

Application No.: 10828052.0

The search has started on 27.01.15 (see Notice from the European Patent Office dated 03/2013, OJ EPO 2013, 153).

Receiving Section

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Office européen des brevets

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Betten & Resch
Theatinerstrasse 8
80333 München
ALLEMAGNE

Date
16.08.12

Reference	Application No./Patent No.
NBA 038 WO/EP	10828052.0 - 1241 / 2498492 PCT/JP2010006067
Applicant/Proprietor	
NEC Corporation	

Notification of European publication number and information on the application of Article 67(3) EPC

You are hereby informed that the technical preparations for the publication of the translation of the above-mentioned international application as supplied to the EPO pursuant to Article 153(4) EPC have been completed.

The translation will be published on 12.09.12.
The publication number is: 2498492.
The publication in accordance with Article 153(4) EPC will be mentioned in European Patent Bulletin number 2012/37 (**http://www.european-patent-office.org/e_pub/bulletin/index.htm**).

The title of the invention in the three official languages of the European Patent Office is worded as follows:

VERTEILUNGSSYSTEM
DISTRIBUTION SYSTEM
SYSTÈME DE DISTRIBUTION

The provisional protection under Article 67(1) and (2) EPC in the individual contracting states becomes effective only when the conditions referred to in Article 67(3) EPC have been fulfilled. For further information, also with respect to extension states, please refer to the EPO brochure "National law relating to the EPC" (**http://www.epo.org/patents/law/legal-texts/national-law-epc.html**).

In all future communications to the EPO, please quote the application number as indicated above, i.e. including the final four figures (which identify the Directorate responsible for the subsequent procedure).

Remark
For European patent applications with a date of publication after 01.04.05, no paper copies will be forwarded to the applicant any longer. The publication can be downloaded, free of charge, from the EPO publication server **https://data.epo.org/publication-server/** or can be ordered from the Vienna sub-office upon payment of a fee (see Decision of the President of the EPO dated 12 July 2007 concerning the form of publication of European patent applications, European search reports and European patent specifications, Special edition No. 3, OJ EPO 2007, 97).

Receiving Section

Europäisches Patentamt • European Patent Office • Office européen des brevets

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference N00099WO	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/JP2010/006067	International filing date *(day/month/year)* 13 October 2010 (13.10.2010)	Priority date *(day/month/year)* 05 November 2009 (05.11.2009)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant NEC Corporation		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 12 June 2012 (12.06.2012)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Masashi Honda e-mail: pt08.pct@wipo.int

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

TRANSLATION

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	09.11.2010
Applicant's or agent's file reference N00099WO	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/JP2010/006067	13.10.2010	05.11.2009

International Patent Classification (IPC) or both national classification and IPC
H04N7/173(2006.01)i

Applicant
NEC Corporation

1. This opinion contains indications relating to the following items:

- ☒ Box No. I — Basis of the opinion
- ☐ Box No. II — Priority
- ☐ Box No. III — Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV — Lack of unity of invention
- ☒ Box No. V — Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI — Certain documents cited
- ☐ Box No. VII — Certain defects in the international application
- ☐ Box No. VIII — Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/JP	Date of completion of this opinion	Authorized officer
Facsimile No.		Telephone No.

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/JP2010/006067

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into _____ , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/JP2010/006067

Box No. V **Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-26	YES
	Claims		NO
Inventive step (IS)	Claims	1-26	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-26	YES
	Claims		NO

2. Citations and explanations:

Document 1: Shigeyuki SAKAZAWA et al., "A Study on Dynamic Control of Coding Rate for TCP Video Streaming", IEICE Technical Report, 15 November 2002, vol. 102, no. 469, pages 19-24, ISSN: 0913-5685, in particular, page 21, right column, line 2 to page 22, left column, line 7; page 22, left column, the last 11 lines

Document 2: Yuko ONOE et al., "Network Information Based Rate. Controls on Multimedia Streaming Servers", IPSJ Journal, 15 March 2003, vol. 44, no. 3, pages 625-636, ISSN: 0387-5806, in particular, page 627, left column, the last 2 lines; page 627, right column, lines 1-8

Document 3: Takao KOYAMA et al., "A Transmission Method Using Multicast Groups for Observing the Simultaneous Arrival Time Specified by SLA", The Transactions of the Institute of Electronics, Information and Communication Engineers, 01 July 2004, vol. J87-B, no. 7, pages 929-939, ISSN: 1344-4697, in particular, page 930, left column, the last 5 lines

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IPR2023-01239 (Peloton v. NEC)

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Claims 1-26

Document 1 defines the general state of the art in the relevant technical field. Document 1 indicates that in a server, streams of a plurality of bit rates are simultaneously generated, the generated streams are stored in MP4 multitrack format, and among the streams of the plurality of bit rates, the streams, the bit rate of which is designated by a terminal, are transmitted from the server, whereas in the terminal, the buffer accumulation status is examined by means of a decodable time, and the bit rate of a fragment to be requested next is determined.

Document 2 defines the general state of the art in the relevant technical field, and discloses an “end-to-end rate control function” in the “server side”, wherein the server switches the “encoding rates” of multimedia content on the basis of the “buffer usage of an end”.

Document 3 defines the general state of the art in the relevant technical field, and discloses a method in which clients belonging to a multicast group can receive content at the same time.

Meanwhile, claim 1 describes a configuration of “an encoding rate determination means for determining the encoding rate on the basis of a remaining period of time from the current time to a reproduction start time that has been set as the time when the receiving device started reproduction of contents, and the time when the content can be reproduced on the basis of the content data stored in the storage device of the receiving device”; however, documents 1-3 neither disclose nor suggest such a configuration.

Therefore, claim 1 is novel and involves an inventive step.

Box No. V **Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

The same applies to claims 2-26.

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IPR2023-01239 (Peloton v. NEC)

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Theatinerstrasse 8
80333 München
ALLEMAGNE

Date: 21.06.12

Reference	Application No./Patent No.
NBA 038 WO/EP	10828052.0 - 1241 PCT/JP2010006067
Applicant/Proprietor: NEC Corporation	

Communication pursuant to Rules 161(2) and 162 EPC

1. Amendment of the application (R. 161(2) EPC)

The above-mentioned international (Euro-PCT) application has entered the European phase.

Under Articles 28, 41 PCT and Rules 52, 78 PCT the application may be amended before a designated or elected Office.

In accordance with Rule 161(2) EPC, you may amend your application once within a **non-extendable period of six months** after notification of the present communication.

If filing amendments, you must identify them and indicate the basis for them in the application as filed. Failure to meet either requirement may lead to a communication from the Examining Division requesting that you correct this deficiency (R. 137(4) EPC).

The claims applicable on expiry of this period, i.e. those filed on entry into the European phase or in response to the present communication, will form the basis for the calculation of any claims fee to be paid (see page 2).

--2/

2 Claims fees under Rule 162 EPC

If the application documents on which the European grant procedure is to be based comprise more than fifteen claims, a claims fee shall be payable for the sixteenth and each subsequent claim within the period provided for in Rule 159(1) EPC.

☐ Based on the application documents currently on file, all necessary claims fees have already been paid (or the documents do not comprise more than 15 claims).

☑ All necessary fees will be/have been debited automatically according to the automatic debit order.

☐ The claims fees due for the claims ..... to ..... were not paid within the above-mentioned period.

Any outstanding claims fee, either based on the current set of claims or on any amended claims to be filed pursuant to Rule 161 EPC (see page 1), may still be validly paid within a **non-extendable period of six months** after notification of this communication (R. 162(2) EPC).

If a payment is made for only some of the claims, you must indicate for which claims it is intended. If a claims fee is not paid in due time, the claim concerned is deemed to be abandoned (R. 162(4) EPC).

If claims fees have already been paid, but on expiry of the above-mentioned period there is a new set of claims containing fewer fee-incurring claims than before, the claims fees in excess of those due under Rule 162(2), second sentence EPC will be refunded (R. 162(3) EPC).

You are reminded that the supplementary search carried out according to Article 153(7) EPC will relate only to the last set of claims applicable on expiry of the above period AND will be confined to those fee-incurring claims for which fees have been paid in due time.

The claims fee is currently

EUR 225 for the 16th and each subsequent claim up to the limit of 50
EUR 555 for the 51st and each subsequent claim

Note to users of the automatic debiting procedure
Unless the EPO receives prior instructions to the contrary, the fees for all claims incurring fees will be debited on the last day of the period for payment. For further details see the Arrangements for the automatic debiting procedure, Supplement to OJ EPO 3/2009.

Important information concerning fee amounts
Following any amendment to the Rules relating to Fees, the amount(s) mentioned in this communication may be different from the amount(s) **actually due on the date of payment.** The latest version of the Schedule of fees and expenses, published as a Supplement to the Official Journal of the EPO, is also available on the EPO website (**www.epo.org**) and can be found under **www.epo.org/schedule-of-fees**, which allows the viewing, downloading and searching for individual fee amounts, both current and previous.

Payments by cheque delivered or sent direct to the EPO are no longer accepted as from 1 April 2008 (see OJ EPO 2007, 626).

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IPR2023-01239 (Peloton v. NEC)

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c/o NEC Corporation
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Tokyo 108-8001
JAPON

Date
19.06.12

Reference	Application No./Patent No.
	10828052.0 - 1241 PCT/JP2010006067
Applicant/Proprietor	
NEC Corporation	

Notification of the data mentioned in Rule 19(3) EPC

In the above-identified patent application you are designated as inventor/co-inventor.
Pursuant to Rule 19(3) EPC the following data are notified herewith:

DATE OF FILING	: 13.10.10
PRIORITY	: JP/05.11.09/ JPA 2009253581
TITLE	: DISTRIBUTION SYSTEM
DESIGNATED STATES	: AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

Receiving Section

Europäisches Patentamt • European Patent Office • Office européen des brevets

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference N00099WO	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/JP2010/006067	International filing date *(day/month/year)* 13 October 2010 (13.10.2010)	Priority date *(day/month/year)* 05 November 2009 (05.11.2009)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant NEC Corporation		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 08 May 2012 (08.05.2012)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Masashi Honda e-mail: pt08.pct@wipo.int

Form PCT/IB/373 (January 2004)

特 許 協 力 条 約

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ＰＣＴ
国際調査機関の見解書
（法施行規則第40条の2）
〔ＰＣＴ規則43の2.1〕

発送日 （日.月.年）	０９．１１．２０１０
出願人又は代理人 の書類記号　N00099WO	今後の手続きについては、下記２を参照すること。

国際出願番号	国際出願日	優先日
ＰＣＴ／ＪＰ２０１０／００６０６７	（日.月.年）　１３．１０．２０１０	（日.月.年）　０５．１１．２００９

国際特許分類（ＩＰＣ）Int.Cl. H04N7/173(2006.01)i

出願人（氏名又は名称）
日本電気株式会社

１．この見解書は次の内容を含む。

- ☑ 第Ⅰ欄　見解の基礎
- ☐ 第Ⅱ欄　優先権
- ☐ 第Ⅲ欄　新規性、進歩性又は産業上の利用可能性についての見解の不作成
- ☐ 第Ⅳ欄　発明の単一性の欠如
- ☑ 第Ⅴ欄　ＰＣＴ規則43の2.1(a)(i)に規定する新規性、進歩性又は産業上の利用可能性についての見解、それを裏付けるための文献及び説明
- ☐ 第Ⅵ欄　ある種の引用文献
- ☐ 第Ⅶ欄　国際出願の不備
- ☐ 第Ⅷ欄　国際出願に対する意見

２．今後の手続き
国際予備審査の請求がされた場合は、出願人がこの国際調査機関とは異なる国際予備審査機関を選択し、かつ、その国際予備審査機関がＰＣＴ規則66.1の2(b)の規定に基づいて国際調査機関の見解書を国際予備審査機関の見解書とみなさない旨を国際事務局に通知していた場合を除いて、この見解書は国際予備審査機関の最初の見解書とみなされる。

この見解書が上記のように国際予備審査機関の見解書とみなされる場合、様式ＰＣＴ／ＩＳＡ／２２０を送付した日から３月又は優先日から２２月のうちいずれか遅く満了する期限が経過するまでに、出願人は国際予備審査機関に、適当な場合は補正書とともに、答弁書を提出することができる。

さらなる選択肢は、様式ＰＣＴ／ＩＳＡ／２２０を参照すること。

３．さらなる詳細は、様式ＰＣＴ／ＩＳＡ／２２０の備考を参照すること。

見解書を作成した日
２７．１０．２０１０

名称及びあて先 日本国特許庁（ＩＳＡ／ＪＰ） 郵便番号１００－８９１５ 東京都千代田区霞が関三丁目４番３号	特許庁審査官（権限のある職員） 久保　光宏	５Ｃ　９１８９
	電話番号　０３－３５８１－１１０１　内線　３５４１	

様式ＰＣＴ／ＩＳＡ／２３７（表紙）（２００９年７月）

国際調査機関の見解書

国際出願番号　ＰＣＴ／ＪＰ２０１０／００６０６７

第Ⅰ欄　見解の基礎

１．言語に関し、この見解書は以下のものに基づき作成した。

☑ 出願時の言語による国際出願

☐ 出願時の言語から国際調査のための言語である＿＿＿＿＿＿＿＿語に翻訳された、この国際出願の翻訳文
（ＰＣＴ規則12.3(a)及び23.1(b)）

２．☐ この見解書は、ＰＣＴ規則 91 の規定により国際調査機関が認めた又は国際調査機関に通知された明らかな誤りの訂正を考慮して作成した（ＰＣＴ規則 43 の 2.1(b)）。

３．この国際出願で開示されたヌクレオチド又はアミノ酸配列に関して、提出された以下の配列表に基づき見解書を作成した。

ａ．提出手段　☐ 紙形式

☐ 電子形式

ｂ．提出時期　☐ 出願時の国際出願に含まれていたもの

☐ この国際出願と共に電子形式により提出されたもの

☐ 出願後に、調査のために、この国際調査機関に提出されたもの

４．☐ さらに、複数の版の配列表又は配列表の写しを提出した場合、出願後に提出した配列の写し若しくは追加して提出した配列の写しが、出願時に提出した配列と同一である旨又は出願時の開示を超える事項を含まない旨の陳述書の提出があった。

５．補足意見：

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第Ⅴ欄　新規性、進歩性又は産業上の利用可能性についてのＰＣＴ規則43の2.1(a)(i)に定める見解、それを裏付ける文献及び説明

１．　見解

新規性（Ｎ）	請求項	１－２６	有
	請求項		無
進歩性（ＩＳ）	請求項	１－２６	有
	請求項		無
産業上の利用可能性（ＩＡ）	請求項	１－２６	有
	請求項		無

２．　文献及び説明

文献１：
酒澤茂之，外３名，「ＴＣＰビデオストリーミングの動的レート制御方式の検討」，電子情報通信学会技術研究報告，２００２年１１月１５日，第１０２巻，第４６９号，第１９－２４頁，ＩＳＳＮ：０９１３－５６８５，特に、第２１頁右コラム第２行－第２２頁左コラム第７行の記載及び第２２頁左コラムの末尾１１行の記載.

文献２：
尾上裕子，外６名，「マルチメディアストリーミング配信サーバにおけるネットワーク情報活用型レート制御方式」，情報処理学会論文誌，２００３年３月１５日，第４４巻，第３号，第６２５－６３６頁，ＩＳＳＮ：０３８７－５８０６，特に、第６２７頁左コラムの末尾２行の記載及び第６２７頁右コラム第１－８行の記載.

文献３：
小山貴夫，外４名，「ＳＬＡで規定された同時到着を遵守するための複数マルチキャストを用いた伝送方式」，電子情報通信学会論文誌，２００４年７月１日，第Ｊ８７－Ｂ巻，第７号，第９２９－９３９頁，ＩＳＳＮ：１３４４－４６９７，特に、第９３０頁左コラムの末尾５行の記載.

請求項１－２６
文献１は、当該技術分野における一般的な技術水準を示す文献であり、サーバにおいて、複数ビットレートのストリームを同時生成し、これらをＭＰ４マルチトラック形式で格納し、前記複数ビットレートのストリームのうち、端末から指定されたビットレートのストリームをサーバが送出することと、端末において、バッファ蓄積状態を復号可能時間で評価し、次に要求するフラグメントのビットレートを決定することが開示されている。
文献２は、当該技術分野における一般的な技術水準を示す文献であり、「エンドのバッファ使用率」に基づき、サーバがマルチメディアコンテンツの「符号化レート」

（補充欄に続く）

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補充欄

いずれかの欄の大きさが足りない場合

第 Ⅴ．２ 欄の続き

の切替えを行うという「サーバ側」の「エンドツーエンドレート制御機能」が開示されている。

文献３は、当該技術分野における一般的な技術水準を示す文献であり、マルチキャストグループに属するクライアントが、同時刻にコンテンツを受信できる方法が開示されている。

一方、請求項１には、「現時点から、前記受信装置が前記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、前記受信装置の前記記憶装置に記憶されている前記コンテンツデータに基づいて前記コンテンツを再生可能な時間である再生可能時間と、に基づいて、前記符号化レートを決定する符号化レート決定手段」という構成が記載されているが、この構成を上記文献１－３は、開示も示唆もしない。

したがって、請求項１は新規性、進歩性をともに有する。

請求項２－２６についても同様。

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Europäisches Patentamt
European Patent Office
Office européen des brevets

Acknowledgement of receipt

We hereby acknowledge receipt of the form for entry into the European phase (EPO as designated or elected Office) as follows:

Submission number	1606680
PCT application number	PCT/JP2010/006067
EP application number	10828052.0
Date of receipt	04 May 2012
Receiving Office	European Patent Office, The Hague
Your reference	NBA 038 WO/EP
Applicant	
Country	

Documents submitted	package-data.xml application-body.xml SPECTRANEPO-1.pdf\NBA038WOEP Translation.pdf (83 p.)	ep-euro-pct.xml epf1200.pdf (4 p.)

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Correction by the EPO of errors in debit instructions filed by eOLF

Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

ABSTRACT

A distribution system 100 includes a transmission device 110 and a reception device 120. The transmission device transmits content data coded with a certain code rate to the reception device. The reception device, while receiving the content data transmitted by the transmission device, stores received data into a storage device and also reproduces content based on the stored data. The distribution system determines a code rate based on a remaining time before reproduction start time from a present moment and an available reproduction time, which is a time available for reproduction of the content based on the stored data. The transmission device changes the code rate of the content data to be transmitted to the determined code rate. The reception device starts reproduction of the content at the reproduction start point.

CLAIMS

1. A distribution system, including a transmission device and a reception device configured to be capable of communicating with each other,

the transmission device being equipped with a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device, and

the reception device being equipped with a content reproducing means for, while receiving the content data transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data,

the distribution system, comprising a code rate determining means for determining the code rate based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device, wherein:

the content transmitting means is configured to change the code rate of the content data to be transmitted to the reception device to the determined code rate; and

the content reproducing means is configured to start reproduction of the content at the set reproduction start time.

2. The distribution system according to Claim 1, wherein the code rate determining means is configured to determine a value becoming smaller as the available reproduction time becomes

shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

3. The distribution system according to Claim 2, wherein the code rate determining means is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

4. The distribution system according to any of Claims 1 to 3, wherein the code rate determining means is configured to determine the code rate with every change period set in advance.

5. The distribution system according to any of Claims 1 to 4, including a plurality of the reception devices,

the distribution system, comprising a synchronous reproduction controlling means for matching reproduction positions of the content to be reproduced by the plurality of the reception devices, respectively, with each other among the plurality of the reception devices.

6. The distribution system according to Claim 5, comprising a reproduction start time

setting means for setting the reproduction start time based on a target available reproduction time, which is a target value of the available reproduction time.

7. The distribution system according to Claim 5 or 6, wherein the content transmitting means is configured to, when second reproduction start time, which is reproduction start time set for a second reception device as one of the plurality of the reception devices, is later than first reproduction start time, which is reproduction start time set for a first reception device as another one of the plurality of the reception devices, estimate a reproduction position of the content being reproduced by the first reception device at the second reproduction start time and transmit a portion of the content data at and after the estimated reproduction position to the second reception device.

8. The distribution system according to Claim 6 or 7, wherein the reproduction start time setting means is configured to, for each reception device of the plurality of the reception devices, calculate an each-device reproduction preparation time as a time required for the reception device to start reproduction of the content and set the reproduction start time based on a maximum value of the calculated each-device reproduction preparation time.

9. The distribution system according to any of Claims 6 to 8, wherein the reproduction start time setting means is configured to set the reproduction start time based on an activation time, which is a time required for activation of an application program to be executed by the reception device for reproduction of the content, and the target available reproduction time.

10. The distribution system according to any of Claims 6 to 9, wherein the reproduction start time setting means is configured to set the reproduction start time based on a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time, and the target available reproduction time.

11. A distribution method applied to a distribution system including a transmission device and a reception device configured to be capable of communicating with each other, the distribution method comprising:

transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device, by the transmission device;

while receiving the content data transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data, by the reception device;

determining the code rate based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device;

changing the code rate of the content data to be transmitted to the reception device to the determined code rate, by the transmission device; and

starting reproduction of the content at the set reproduction start time, by the reception device.

12. The distribution method according to Claim 11, comprising:

determining a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

13. The distribution method according to Claim 12, comprising:

acquiring a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time; and

determining a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

14. The distribution method according to any of Claims 11 to 13, comprising:

determining the code rate with every change period set in advance.

15. The distribution method according to any of Claims 11 to 14, applied to the distribution system including a plurality of the reception devices, the distribution method comprising:

matching reproduction positions of the content to be reproduced by the plurality of the

reception devices, respectively, with each other among the plurality of the reception devices.

16. A transmission device configured to be capable of communicating with a reception device, the transmission device comprising:

a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device,

wherein the content transmitting means is configured to change the code rate of the content data to be transmitted to the reception device to a code rate determined based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

17. The transmission device according to Claim 16, comprising:

a code rate determining means for determining the code rate based on the remaining time and the available reproduction time.

18. The transmission device according to Claim 16 or 17, wherein the code rate determining means is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code

rate.

19. The transmission device according to Claim 18, wherein the code rate determining means is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

20. The transmission device according to any of Claims 16 to 19, wherein the code rate determining means is configured to determine the code rate with every change period set in advance.

21. A program comprising instructions for causing a transmission device configured to be capable of communicating with a reception device to realize a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device,

wherein the content transmitting means is configured to change the code rate of the content data to be transmitted to the reception device to a code rate determined based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the

storage device of the reception device.

22. A reception device configured to be capable of communicating with a transmission device, the reception device comprising:

a content reproducing means for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means for determining the code rate based on a remaining time before reproduction start time set as time to start reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device,

wherein the content reproducing means is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

23. The reception device according to Claim 22, wherein the code rate determining means is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

24. The reception device according to Claim 23, wherein the code rate determining means is

configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

25. The reception device according to any of Claims 22 to 24, wherein the code rate determining means is configured to determine the code rate with every change period set in advance.

26. A program comprising instructions for causing a reception device configured to be capable of communicating with a transmission device to realize:

a content reproducing means for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means for determining the code rate based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device,

wherein the content reproducing means is configured to receive content data coded with

the determined code rate and start reproduction of the content at the set reproduction start time.

DESCRIPTION

TITLE: DISTRIBUTION SYSTEM

TECHNICAL FIELD

[0001]

The present invention relates to a distribution system that transmits content data representing content from a transmission device to a reception device.

BACKGROUND ART

[0002]

There is a known distribution system that includes a transmission device and a plurality of reception devices configured to be capable of communicating with each other and allows the plurality of reception devices to synchronously reproduce content. As one of this type of distribution systems, a distribution system described in Patent Document 1 matches time of a clock disposed to each of the plurality of reception devices with time of a reference clock. Moreover, the transmission device transmits reproduction start time, which is time that the reception device starts reproduction of content, to each reception terminal.

[0003]

Then, the transmission device transmits content data representing content (video, audio, etc.) to each of the reception devices. Each of the reception devices stores received data among the content data into a storage device (a buffer) while receiving the content data. Moreover, each

of the reception devices starts reproduction of content based on the stored data at the reproduction start time. As a result, it is possible to match the positions to reproduce the content with each other among the plurality of reception devices.

[0004]

Further, a distribution system described in Patent Document 2 is a system that allows a plurality of reception devices to synchronously reproduce content even if time to start reproduction of the content varies depending on the reception device. In this distribution system, while a first reception device is reproducing content, a second reception device estimates a time required to start reproduction of the content and determines reproduction start time based on the estimated time. Then, the second reception device transmits the determined reproduction start time to the transmission device.

[0005]

Consequently, the transmission device transmits, to the second reception device, content data to be transmitted to the first reception device at and after the reproduction start time. Then, the second reception device starts reproduction of content based on the stored data at the reproduction start time. As a result, it is possible to match positions to reproduce content with each other between the first reception device and the second reception device.

[0006]

[Patent Document 1] Japanese Unexamined Patent Application Publication No. 2005-191786

[Patent Document 2] Japanese Unexamined Patent Application Publication No. 2007-13705

[0007]

While the reception device is receiving content data, the amount of data that the reception device receives from the transmission device per unit time (i.e., a communication speed) varies depending on the status of use of a communication line, and so on. Therefore, when the communication speed becomes extremely low, there is a case that the data amount of content data stored in the storage device of the reception device does not reach a sufficient amount by the reproduction start time. In such a case, there is a fear that the reception device cannot start reproduction of content at the reproduction start time.

[0008]

In order to deal with this, it can be considered to configure a distribution system to change a code rate of content data to be transmitted based on an available reproduction time, which is a time that it is possible to reproduce content based on content data stored in the storage device of the reception device.

[0009]

However, during a period between start of reception of content data by the reception device and reproduction start time, the available reproduction time gradually increases from 0. Therefore, in a case that the code rate is determined based on only the available reproduction time, there is a fear that the code rate is set to be extremely small immediately after the reception device starts reception of the content data and, on the other hand, the code rate is set to be extremely high immediately before the reproduction start time.

[0010]

Further, such a problem arises not only in a distribution system in which a plurality of

reception devices synchronously reproduce content but also in a distribution system in which one reception device starts reproduction of content at set reproduction start time.

SUMMARY

[0011]

Accordingly, an object of the present invention is to provide a distribution system capable of solving the abovementioned problems, "the code rate may be set to be extremely high" and "the reception device may be unable to start reproduce content at set reproduction start time."

[0012]

In order to achieve the object, a distribution system of an exemplary embodiment of the present invention is a system including a transmission device and a reception device configured to be capable of communicating with each other.

The transmission device is equipped with a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device.

The reception device is equipped with a content reproducing means for, while receiving the content data transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data.

The distribution system comprises a code rate determining means for determining the code rate based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an

available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

The content transmitting means is configured to change the code rate of the content data to be transmitted to the reception device to the determined code rate.

The content reproducing means is configured to start reproduction of the content at the set reproduction start time.

[0013]

Further, a distribution method of another exemplary embodiment of the present invention is a method that is applied to a distribution system including a transmission device and a reception device configured to be capable of communicating with each other and that comprises:

transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device, by the transmission device;

while receiving the content data transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data, by the reception device;

determining the code rate based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device;

changing the code rate of the content data to be transmitted to the reception device to

the determined code rate, by the transmission device; and

starting reproduction of the content at the set reproduction start time, by the reception device.

[0014]

Further, a transmission device of another exemplary embodiment of the present invention is a device configured to be capable of communicating with a reception device.

The transmission device comprises a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device.

The content transmitting means is configured to change the code rate of the content data to be transmitted to the reception device to a code rate determined based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

[0015]

Further, a program of another exemplary embodiment of the present invention comprises instructions for causing a transmission device configured to be capable of communicating with a reception device to realize a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device.

The content transmitting means is configured to change the code rate of the content data

to be transmitted to the reception device to a code rate determined based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

[0016]

Further, a reception device of another exemplary embodiment of the present invention is a device configured to be capable of communicating with a transmission device.

The reception device comprises:

a content reproducing means for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means for determining the code rate based on a remaining time before reproduction start time set as time to start reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device.

The content reproducing means is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

[0017]

Further, a program of another exemplary embodiment of the present invention comprises instructions for causing a reception device configured to be capable of communicating

with a transmission device to realize:

a content reproducing means for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means for determining the code rate based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

The content reproducing means is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

[0018]

With the configurations described above, the present invention enables a reception device to securely start reproduction of content at set reproduction start time while avoiding meaninglessly lowering a code rate.

BRIEF DESCRIPTION OF DRAWINGS

[0019]

Fig. 1 is a diagram showing a schematic configuration of a distribution system according to a first exemplary embodiment of the present invention;

Fig. 2 is a block diagram schematically showing a function of the distribution system

according to the first exemplary embodiment of the present invention;

Fig. 3 is a sequence diagram showing an operation of the distribution system according to the first exemplary embodiment of the present invention;

Fig. 4 is a flowchart showing a transmission control program executed by a server device according to the first exemplary embodiment of the present invention;

Fig. 5 is a table showing session information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 6 is a flowchart showing a reproduction start control program executed by a terminal device according to the first exemplary embodiment of the present invention;

Fig. 7 is a table showing session information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 8 is a table showing session information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 9 is a table showing history information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 10 is a flowchart showing a code rate change control program executed by the server device according to the first exemplary embodiment of the present invention;

Fig. 11 is a table showing history information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 12 is a table showing history information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 13 is a sequence diagram showing an operation of the distribution system according

to the first exemplary embodiment of the present invention;

Fig. 14 is a table showing session information stored by the server device according to the first exemplary embodiment of the present invention;

Fig. 15 is a table showing session information stored by the server device according to the first exemplary embodiment of the present invention; and

Fig. 16 is a block diagram schematically showing a function of a distribution system according to a second exemplary embodiment of the present invention.

EXEMPLARY EMBODIMENTS

[0020]

Below, exemplary embodiments of a distribution system, a distribution method, a transmission device, a program and a reception device according to the present invention will be described with reference to Figs. 1 to 16.

[0021]

<First Exemplary Embodiment>

As shown in Fig. 1, a distribution system 1 according to the first exemplary embodiment includes a server device (a transmission device) 10 and a plurality of (in this exemplary embodiment, three) terminal devices (reception devices) 20a, 20b and 20c. The server device 10 and the terminal devices 20a to 20c are connected so as to be capable of communicating with each other via a communication line (in this exemplary embodiment, the Internet) NW.

[0022]

The server device 10 is an information processing device. The server device 10 is

equipped with a central processing unit (CPU) and a storage device (a memory and a hard disk drive (HDD)), which are not shown in the drawings. The server device 10 is configured to realize a function described later by execution of a program stored in the storage device by the CPU.

[0023]

In this exemplary embodiment, the respective terminal devices 20a to 20c are personal computers. The respective terminal devices 20a to 20c may be mobile phone terminals, personal handyphone systems (PHS), personal data assistances (personal digital assistants; PDA), car navigation terminals, game terminals, or the like.

[0024]

The terminal devices 20a to 20c are each equipped with a CPU, a storage device, an input device and an output device. The output device has a display. The output device causes the display to display an image composed of letters, figures and so on based on image information outputted by the CPU. The input device has a keyboard and a mouse. The terminal devices 20a to 20c are each configured so that information based on an operation by a user is inputted via the keyboard and the mouse.

[0025]

The terminal devices 20a to 20c are each configured to realize a function described later by execution of a program stored in the storage device by the CPU.

[0026]

Fig. 2 is a block diagram showing a function of the distribution system 1 configured as described above. Herein, a function of the terminal device 20a among the terminal devices 20a to 20c will be described. The terminal devices 20b and 20c each have the same function as the

terminal device 20a.

[0027]

Further, a function of the distribution system 1 is realized by execution of a program presented with a flowchart shown in Fig. 6 described later, and so on, by the CPU of the terminal device 20a, and by execution of programs presented with flowcharts shown in Figs. 4 and 10, and so on, by the CPU of the server device 10.

[0028]

A function of the terminal device 20a includes a request transmission part 31, a synchronous reproduction controlling part (a synchronous reproduction controlling means) 32, a content reproducing part (a content reproducing means) 33, and an available reproduction time transmission part 34.

[0029]

Further, a function of the server device 10 includes a request reception part 41, a session information storage part 42, a reproduction start time setting part (a reproduction start time setting means) 43, a content data storage part 44, a content transmitting part (a content transmitting means) 45, an available reproduction time reception part 46, and a code rate determining part (a code rate determining means) 47.

[0030]

The request transmission part 31 of the terminal device 20a accepts a session start instruction inputted by the user via the input device. The session start instruction is information of an instruction to start a session. The session start instruction includes content identification information (content ID) for identifying content and other terminal ID, which is terminal

identification information (terminal ID) for identifying another terminal device that synchronously reproduces content.

[0031]

Upon acceptance of the session start instruction, the request transmission part 31 transmits, to the server device 10, a session start request including: the content ID included in the session start instruction; and terminal ID composed of own terminal ID, which is terminal identification information (terminal ID) for identifying an own device (the terminal device 20a), and the other terminal ID included in the session start instruction. The session start request is information of a request to start a session.

[0032]

The request reception part 41 of the server device 10 receives the session start request from the terminal device 20a. Upon reception of the session start request, the request reception part 41 generates session identification information (session ID) for identifying a session. Moreover, the request reception part 41 stores, into the session information storage part 42, session information including: the generated session ID; and the content ID and the terminal ID that are included in the session start request.

[0033]

In addition, the request reception part 41 transmits the generated session ID to each of the terminal devices 20a to 20c identified by the terminal ID included in the session start request.

[0034]

The request transmission part 31 of the terminal device 20a receives the session ID from the server device 10. Moreover, the request transmission part 31 accepts a session participation

instruction inputted by the user via the input device. The session participation instruction is information of an instruction to participate in a session.

[0035]

Upon acceptance of the session participation instruction, the request transmission part 31 transmits, to the server device 10, a session participation request including; the received session ID; the terminal identification information (the terminal ID) for identifying the own device (the terminal device 20a), i.e., the own terminal ID; an activation time; and a communication speed. The session participation request is information of a request to participate in a session.

[0036]

The activation time is a time required to activate an application program that the terminal device 20a executes for reproducing content. Moreover, the communication speed is the data amount of data transmitted from the server device 10 to the terminal device 20a per unit time. In this exemplary embodiment, the activation time and the communication speed are values inputted by the user. The terminal device 20a may be configured to measure the activation time and the communication speed and transmit a session participation request including the measured activation time and communication speed.

[0037]

The request reception part 41 of the server device 10 receives the session participation request from each of the terminal devices 20a to 20c. Upon reception of the session participation request, the request reception part 41 adds the activation time and communication speed included in the session participation request to the session information including the session ID and

terminal ID included in the session participation request, among the session information stored in the session information storage part 42.

[0038]

The content data storage part 44 of the server device 10 stores (accumulates) a plurality of content data in advance. Each of the content data is data representing one of a plurality of contents (e.g., information representing video and/or audio). The content data storage part 44 stores, as the content data representing the respective contents, a plurality of content data in each of which the content is coded with a code rate varying with the content. The code rate represents the data amount (the data size, e.g., the number of bytes) of content data for reproducing content at constant speed (reproducing content at 1x speed) for a unit time (e.g., one second).

[0039]

The reproduction start time setting part 43 of the server device 10 includes a reproduction start time determination part 43a and a reproduction start time transmission part 43b.

[0040]

The reproduction start time determination part 43a determines reproduction start time based on a session participation request received before a lapse of a preset standby time after reception of a session start request. The reproduction start time is time that a terminal device having transmitted the session participation request starts reproduction of content.

[0041]

To be specific, at a moment that the standby time elapses after reception of the session start request, the reproduction start time determination part 43a acquires session information

including session ID generated in response to the session start request, among the session information stored in the session information storage part 42.

[0042]

The reproduction start time determination part 43a calculates an each-device reproduction preparation time T_p for each of the acquired session information (i.e., each of the terminal devices). The each-device reproduction preparation time T_p is a time required for the terminal device to start reproduction of content.

[0043]

In this exemplary embodiment, the reproduction start time determination part 43a extracts content data representing content identified by content ID included in the acquired session information, from among the content data stored in the content storage part 44. Then, the reproduction start time determination part 43a specifies a code rate r having a value that is equal to or less than a communication speed included in the acquired session information and is the closest to the communication speed, from among the code rates of the extracted content data.

[0044]

Then, the reproduction start time determination part 43a calculates a reproduction preparation communication time T_c based on the specified code rate r, a communication speed B included in the acquired session, a preset target available reproduction time T_d, and an equation (1) shown below.

$$T_c = r \cdot T_d / B \qquad (1)$$

[0045]

The target available reproduction time T_d is a target value of an available reproduction

time. The target available reproduction time may be set for each terminal device. Alternatively, the target available reproduction time may be a value received from a terminal device. The available reproduction time is a time that a terminal device can reproduce content based on content data stored in the storage device (a buffer part 33 described later) of the terminal device. The reproduction preparation communication time T_c is a time required for the available reproduction time to coincide with the target available reproduction time T_d after the terminal device starts reception of the content data.

[0046]

Furthermore, the reproduction start time determination part 43a adds an activation time T_a included in the acquired session information and the calculated reproduction preparation communication time T_c, thereby calculating the each-device reproduction preparation time T_p as shown by an equation (2) below.

$$T_p = T_a + T_c \qquad (2)$$

[0047]

In addition, the reproduction start time determination part 43a adds a maximum value T_{pmax} of the calculated each-device reproduction preparation time T_p with present time t, thereby determining reproduction start time T_s as shown by an equation (3) below.

$$T_s = t + T_{pmax} \qquad (3)$$

[0048]

In a case that a session participation request is received after a lapse of the standby time from reception of a session start request, the reproduction start time determination part 43a determines reproduction start time T_s for a terminal device having transmitted the session

participation request in the same manner as described above.

[0049]

Upon determination of the reproduction start time, the reproduction start time determination part 43a adds the determined reproduction start time to the session information including the session ID and terminal ID included in the session participation request that is the basis of determination of the reproduction start time.

[0050]

The reproduction start time transmission part 43b transmits the reproduction start time determined by the reproduction start time determination part 43a to each terminal device having transmitted the session participation request.

Thus, the reproduction start time setting part 43 sets reproduction start time based on a target available reproduction time, an activation time, and a communication speed.

[0051]

The synchronous reproduction controlling part 32 of the terminal device 20a includes a reproduction start time reception part 32a. The reproduction start time reception part 32a receives reproduction start time transmitted from the server device 10. The synchronous reproduction controlling part 32 stores the reproduction start time received by the reproduction start time reception part 32a into the storage device. The synchronous reproduction controlling part 32 determines whether present time has reached the stored reproduction start time (it becomes the reproduction start time at this moment) every time a preset control period elapses.

[0052]

When the present time reaches the stored reproduction start time, the synchronous

reproduction controlling part 32 outputs a reproduction start instruction to the content reproducing part 33. The reproduction start instruction is information of an instruction to start reproduction of content. Thus, the synchronous reproduction controlling part 32 matches positions to reproduce content to be reproduced by the respective terminal devices 20a to 20c with each other among the terminal devices 20a to 20c.

[0053]

The content transmitting part 45 of the server device 10 transmits the content data stored in the content data storage part 44 to the terminal devices 20a to 20c. That is to say, the content transmitting part 45 transmits the content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the terminal devices 20a to 20c.

[0054]

To be specific, when the reproduction start time is determined by the reproduction start time setting part 43, the content transmitting part 45 transmits the content data stored in the content data storage part 44 to the terminal device having transmitted the session participation request that is the basis of determination of the reproduction start time.

[0055]

At this moment, the content transmitting part 45 transmits content data that is identified by the content ID included in the session information including the session ID included in the session participation request and is coded with a code rate specified by the reproduction start time determination part 43a for the terminal device having transmitted the session participation request.

[0056]

In the case of transmitting the content data based on the session participation request received before the standby time elapses after reception of the session start request, the content transmitting part 45 starts transmission of the content data with the head position.

[0057]

On the other hand, in the case of transmitting the content data based on the session participation request received after a lapse of the standby time from reception of the session start request, the content transmitting part 45 determines whether a determination condition is satisfied or not. Herein, the determination condition is a condition that reproduction start time determined by the reproduction start time setting part 43 based on the session participation request (second reproduction start time) is later time than reproduction start time determined by the reproduction start time setting part 43 based on another session participation request including the same session ID as the session participation request (first reproduction start time).

[0058]

In a case that the second reproduction start time is time before the first reproduction start time, the content transmitting part 45 starts transmission of the content data from the head position.

[0059]

On the other hand, in a case that the second reproduction start time is time after the first reproduction start time, the content transmitting part 45 determines a position behind the head position by a difference between the first reproduction start time and the second reproduction start time, as a transmission start position. The transmission start position is in content data, which is a position to start transmission of the content data. Then, the content transmitting part

45 starts transmission of the content data from the determined transmission start position.

[0060]

That is to say, in a case that reproduction start time set for a second terminal device (second reproduction start time) is later time than reproduction start time set for a first terminal device (first start reproduction start time), the content transmitting part 45 estimates a content reproduction position (i.e., a transmission start position) that the first terminal device is reproducing at the second reproduction start time. Then, the content transmitting part 45 transmits a portion of the content data after the estimated reproduction position, to the second terminal device.

[0061]

The content reproducing part 33 of the terminal device 20a includes a content reception part 33a, a buffer part 33b, and a content reproduction execution part 33c.

The content reception part 33a receives content data transmitted by the server device 10. The buffer part 33b stores data received by the content reception part 33a. The content reproduction execution part 33c reproduces content based on the data stored by the buffer part 33b.

[0062]

That is to say, the content reproducing part 33, while receiving content data transmitted by the server device 10, stores received data of the content data into the storage device and reproduces content based on the stored data (performs streaming reproduction).

[0063]

In the case of accepting a reproduction start instruction outputted by the synchronous

reproduction controlling part 32 (i.e., at set reproduction start time), the content reproduction execution part 33c starts reproduction of content.

[0064]

The available reproduction time transmission part 34 of the terminal device 20a acquires an available reproduction time, which is a time that the content reproduction execution part 33c can reproduce the content based on the content data stored by the buffer part 33b, every time an acquisition period (a change period) set in advance elapses. Upon acquisition of the available reproduction time, the available reproduction time transmission part 34 transmits available reproduction time information, which includes the acquired available reproduction time, the own terminal ID (the terminal ID) and the session ID, to the server device 10.

[0065]

The available reproduction time reception part 46 of the server device 10 receives available reproduction time information from the respective terminal devices 20a to 20c.

When the available reproduction time information is received by the available reproduction time reception part 46, the code rate determining part 47 of the server device 10 acquires the reproduction start time included in the session information including the terminal ID and session ID included in the available reproduction time information.

[0066]

The code rate determining part 47 determines a code rate for the terminal device having transmitted the available reproduction time information, based on a remaining time before the acquired (i.e., set) reproduction start time from the present moment and the available reproduction time included in the available reproduction time information.

[0067]

To be specific, the code rate determining part 47 determines, as the code rate, a value that becomes smaller as the available reproduction time becomes shorter than the target available reproduction time and that becomes smaller as the remaining time becomes shorter.

[0068]

In this exemplary embodiment, the code rate determining part 47 calculates (acquires) a communication speed B_n during a period between the present moment and a moment that is the change period before (past), based on an equation (4) shown below, wherein n denotes an integer and represents the number of times of reception of the available reproduction time information from the terminal device.

$$B_n = (T_n - T_{n-1}) \cdot r_n / (t_n - t_{n-1}) \quad (4)$$

[0069]

In the equation, t_n denotes time of reception of the available reproduction time information this time (i.e., time at the present moment), and t_{n-1} denotes time of reception of the available reproduction time information last time (i.e., time at a moment that is the change period before). Moreover, T_n denotes the available reproduction time received this time (i.e., at the present moment), and T_{n-1} denotes the available reproduction time received last time (i.e., at a moment that is the change period before). Moreover, r_n denotes a code rate of content data transmitted during a period between the time t_{n-1} to the time t_n.

[0070]

In this exemplary embodiment, assuming a communication speed is kept at the communication speed B_n during a period between the present moment and the reproduction start

time, the code rate determining part 47 determines a code rate r_{n+1} of content data to be transmitted by time of the available reproduction time information next time (i.e., time at a moment that is the change period after). That is to say, the code rate determining part 47 determines the code rate r_{n+1} based on an equation (5) shown below.

$$r_{n+1} = B_n \cdot (t_s - t_n) / (T_d - T_n) \quad (5)$$

[0071]

That is to say, the code rate determining part 47 determines, as the code rate r_{n+1}, a result of dividing a result of multiplying the acquired communication speed B_n and a remaining time t_s-t_n by a result T_d-T_n of subtracting the available reproduction time T_n from the target available reproduction time T_d.

[0072]

When the code rate r_{n+1} is determined by the code rate determining part 47, the content transmitting part 45 changes content data to be transmitted to the terminal device having transmitted the available reproduction time information having been the basis of determination of the code rate r_{n+1}, to content data coded with the code rate r_{n+1}. That is to say, the content transmitting part 45 changes the code rate of the content data to be transmitted to the terminal device having transmitted the available reproduction time information, to the code rate determined based on the available reproduction time information.

[0073]

In a case that content data of the code rate r_{n+1} determined by the code rate determining part 47 is not stored by the content data storage part 44, the content transmitting part 45 transmits content data having a code rate that is equal to or less than the code rate r_{n+1} and is the closest to

the code rate r_{n+1}, among the content data stored by the content storage part 44.

[0074]

Next, an operation of the abovementioned distribution system 1 will be described. In this exemplary embodiment, the server device 10 stores, for each content, content data respectively coded with 2Mbps, 4Mbps, 16Mbps and 50Mbps into the storage device in advance. Moreover, the target available reproduction time T_d is set to 30 seconds.

[0075]

As shown in Fig. 3, the terminal device 20a accepts a session start instruction including "C01" as content ID, and "R02" and "R03" as other terminal ID. In this exemplary embodiment, "R01" denotes terminal ID for identifying the terminal device 20a, "R02" denotes terminal ID for identifying the terminal device 20b, and "R03" denotes terminal ID for identifying the terminal device 20c.

[0076]

Upon acceptance of the session start instruction, the terminal device 20a transmits a session start request including "C01" as content ID, and "R01," "R02," and "R03" as other terminal ID to the server device 10 (step S101).

[0077]

Upon reception of the session start request from the terminal device 20a, the server device 10 executes a transmission control program shown by a flowchart in Fig. 4. The server device 10 generates "S01" as session ID for identifying a session. Moreover, the server device 10 stores session information including the generated session ID "S01" and the content ID "C01" and terminal ID ("R01", "R02," and "R03") included in the session start request, into the storage

device as shown in Fig. 5.

[0078]

In addition, the server 10 transmits the generated session ID to each of the terminal devices 20a to 20c identified by the terminal ID included in the session start request (step S102 of Fig. 4, step S102 of Fig. 3). After that, the server device 10 waists for the standby time (in this exemplary embodiment, three seconds) (step S202 of Fig. 4).

[0079]

Next, when the user of the terminal device 20a inputs a session participation instruction, the terminal device 20a executes a reproduction start control program shown by a flowchart in Fig. 6. The terminal device 20a transmits, to the server device 10, a session participation request including the received session ID "S01," the terminal ID "R01," an activation time "1200" (ms), and a communication speed "3" (Mbps) (step S301 of Fig. 6, step S103 of Fig. 3).

[0080]

In this exemplary embodiment, like the terminal device 20a, the terminal device 20b also transmits, to the server device 10, a session participation request including the session ID "S01," the terminal ID "R02," an activation time "1000," (ms) and a communication speed "50" (Mbps) (step S104 of Fig. 3).

[0081]

Upon reception of the session participation request from each of the terminal devices 20a and 20b, the server device 10 adds the activation time and communication speed included in the session participation request to the session information including the session ID and terminal ID included in the session participation request among the session information stored in the

storage device, as shown in Fig. 7.

[0082]

Then, after a lapse of the standby time, the server device 10 specifies, for each of the terminal devices 20a and 20b having transmitted the session participation requests, a code rate r that is equal to or less than the communication speed and is the closest to the communication speed, from among the code rates of the content data stored in the storage device. In this exemplary embodiment, the server device 10 specifies "2Mbps" as the code rate r for the terminal device 20a, and specifies "50Mbps" as the code rate r for the terminal device 20b.

[0083]

Next, for each of the terminal devices 20a and 20b having transmitted the session participation requests, the server device 10 calculates each-device reproduction preparation time T_p, based on the communication speed B and activation time T_a included in the stored session information and the preset target available reproduction time T_d (step S203 of Fig. 4).

[0084]

In this exemplary embodiment, the server device 10 acquires "21.2" as the each-device reproduction preparation time T_p for the terminal device 20a and acquires "31" as the each-device reproduction preparation time T_p for the terminal device 20b, based on the equations (1) to (3) shown above.

[0085]

Next, the server device 10 determines reproduction start time T_s ("13:01:34") based on a maximum value T_{pmax} (herein, "31") of the calculated each-device reproduction preparation times T_p (step S204 of Fig. 4). Then, the server device 10 adds the determined reproduction start

time to the session information including the session ID "S01" and the terminal ID "R01" and the session information including the session ID "S01" and the terminal ID "R02," respectively, as shown in Fig. 8.

[0086]

Next, the server device 10 transmits the determined reproduction start time T_s to each of the terminal devices 20a and 20b having transmitted the session participation requests (step S205 of Fig. 4, step S105 of Fig. 3).

[0087]

Thus, the terminal device 20a receives the reproduction start time T_s from the server device 10 (step S302 of Fig. 6). The terminal device 20b also operates like the terminal device 20a after that.

[0088]

Then, the server device 10 determines whether the determined reproduction start time T_s is time after reproduction start time determined based on another session participation request including the same session ID as the received session participation request (step S206 of Fig. 4).

[0089]

At this moment, the server device 10 has not received another session participation request including the same session ID as the received session participation request. Therefore, the server device 10 determines "No" and proceeds to step S208 to start transmission of content data to each of the terminal devices 20a and 20b having transmitted the session participation requests from the head position of the content data (step S208 of Fig. 4, step S106 of Fig. 3).

[0090]

At this moment, the content data that the server device 10 transmits to the terminal device 20a is content data representing content identified by the content ID "C01" included in the session information including the session ID "S01." Moreover, this content data is data coded with the code rate specified based on the communication speed included in the session participation request received from the terminal device 20a.

[0091]

Likewise, the content data that the server device 10 transmits to the terminal device 20b is content data representing content identified by the content ID "C01" included in the session information including the session ID "S01." Moreover, this content data is data coded with the code rate specified based on the communication speed included in the session participation request received from the terminal device 20b.

[0092]

Further, the server device 10 stores history information that associates the session ID and terminal ID included in the session participation request, "0" as the initial value of an available reproduction time, and a difference "31" between the reproduction start time and the present time into the storage device as shown in Fig. 9.

[0093]

On the other hand, the terminal device 20a starts reception of the content data transmitted by the server device 10 (step S303 of Fig. 6). Next, the terminal device 20a determines whether the present time has reached the reproduction start time T_s (step S304 of Fig. 6). At this moment, the present time has not reached the reproduction start time T_s.

[0094]

Therefore, the terminal device 20a determines "No" and proceeds to step S305 to determine whether a transmission period (in this exemplary embodiment, five seconds) has elapsed after start of reception of the content data (step S305 of Fig. 6). At this moment, the transmission period has not elapsed after start of reception of the content data.

[0095]

Therefore, the terminal device 20a determines "No" and returns to step S304 to repeatedly execute the abovementioned process until the transmission period elapses after start of reception of the content data.

[0096]

Then, after a lapse of the transmission period from start of reception of the content data, the terminal device 20a determines "Yes" at step S305 and proceeds to step S306 to acquire an available reproduction time. Herein, it is assumed that the acquired available reproduction time is "7" seconds.

[0097]

Then, the terminal device 20a transmits available reproduction time information including the acquired available reproduction time "7," the terminal ID "R01," and the session ID "S01" to the server device 10 (step S107 of Fig. 3). Likewise, the terminal device 20b transmits available reproduction time information including the acquired available reproduction time "2," the terminal ID "R02," and the session ID "S01" to the server device 10 (step S108 of Fig. 3).

[0098]

On the other hand, the server device 10 proceeds to step S209 of Fig. 4 and, in order to

perform a code rate change control on each of the terminal devices, executes a code rate change control program shown by a flowchart in Fig. 10 independently on each of the terminal devices 20a and 20b having been transmitting the content data.

[0099]

First, a code rate change control that the server device 10 executes on the terminal device 20a will be described.

[0100]

The server device 10 determines whether the present time has reached the reproduction start time T_s (step S401 of Fig. 10). At this moment, the present time has not reached the reproduction start time T_s.

[0101]

Therefore, the server device 10 determines "No" and proceeds to step S402 to determine whether the server device 10 has received available reproduction time information from the terminal device 20a. In a case that the server device 10 has not received available reproduction time information from the terminal device 20a, the server device 10 returns to step S401 to repeatedly execute the abovementioned process.

[0102]

The server device 10 is receiving available reproduction time information from the terminal device 20a now. Therefore, the server device 10 determines "Yes" and proceeds to step S403 to, as shown in Fig. 11, store history information that associates the session ID "S01," terminal ID "R01" and available reproduction time "7" included in the available reproduction time information with a difference "26" between the reproduction start time and the present time,

into the storage device.

[0103]

The server device 10 determines a code rate based on the history information stored in the storage device. In this exemplary embodiment, the server device 10 acquires "2.8 Mbps" as the communication speed B_n based on the equation (4) shown above. Moreover, the server device 10 acquires (determines) "3.165 Mbps" as the code rate r_{n+1} based on the equation (5) shown above (step S403 of Fig. 10).

[0104]

Then, the server device 10 specifies "2 Mbps" as a code rate that is equal to or less than the code rate r_{n+1} and is the closest to the code rate r_{n+1} from among the code rates of the content data stored in the storage device. Next, the server device 10 changes the code rate of the content data being transmitted to the terminal device 20a, to the specified code rate "2 Mbps" (step S404 of Fig. 10). After that, the server device 10 returns to step S401 to repeatedly execute the process described above.

[0105]

Next, a code rate change control that the server device 10 executes on the terminal device 20b will be described.

[0106]

Upon reception of available reproduction time information from the terminal device 20b, the server device 10 proceeds to step S403 of Fig. 10 and, as shown in Fig. 11, stores history information that associates the session ID "S01," terminal ID "R02" and available reproduction time "2" included in the available reproduction time information with a difference "26" between

the reproduction start time and the present time, into the storage device.

[0107]

The server device 10 determines a code rate based on the history information stored in the storage device. In this exemplary embodiment, the server device 10 acquires "20 Mbps" as the communication speed B_n based on the equation (4) shown above. Moreover, the server device 10 acquires (determines) "18.57 Mbps" as the code rate r_{n+1} based on the equation (5) described above (step S403 of Fig. 10).

[0108]

Then, the server device 10 specifies "16 Mbps" as a code rate that is equal to or less than the code rate r_{n+1} and is the closest to the code rate r_{n+1} from among the code rates of the content data stored in the storage device. Next, the server device 10 changes the code rate of the content data being transmitted to the terminal device 20b, to the specified code rate "16 Mbps" (step S404 of Fig. 10). After that, the server device 10 returns to step S401 to repeatedly execute the process described above.

[0109]

Then, when the transmission period elapses again after transmission of the available reproduction time information by the terminal device 20a and the terminal device 20b, the terminal device 20a and the terminal device 20b respectively determine "Yes" at step S305 of Fig. 6 and proceed to step S306 to transmit available reproduction time information to the server device 10.

[0110]

It is assumed that the terminal device 20a transmits available reproduction time

information including an available reproduction time "18," terminal ID "R01" and session ID "S01" to the server device 10 and the terminal device 20b transmits available reproduction time information including an available reproduction time "14," terminal ID "R02" and session ID "S01" to the server device 10.

[0111]

First, a code rate change control that the server device 10 executes on the terminal device 20a will be described.

[0112]

The server device 10 determines "Yes" at step S402 of Fig. 10 and proceeds to step S403 to, as shown in Fig. 12, store history information that associates the session ID "S01," terminal ID "R01" and available reproduction time "18" included in the available reproduction time information with a difference "21" between the reproduction start time and the present time, into the storage device.

[0113]

The server device 10 determines a code rate based on the history information stored in the storage device. In this exemplary embodiment, the server device 10 acquires "4.4 Mbps" as the communication speed B_n based on the equation (4) shown above. Moreover, the server device 10 acquires (determines) "7.7 Mbps" as the code rate r_{n+1} based on the equation (5) shown above (step S403 of Fig. 10).

[0114]

Then, the server device 10 specifies "4 Mbps" as a code rate that is equal to or less than the code rate r_{n+1} and is the closest to the code rate r_{n+1} from among the code rates of the content

data stored in the storage device. Next, the server device 10 changes the code rate of the content data being transmitted to the terminal device 20a, to the specified code rate "4 Mbps" (step S404 of Fig. 10). After that, the server device 10 returns to step S401 to repeatedly execute the process described above.

[0115]

Next, a code rate change control that the server device 10 executes on the terminal device 20b will be described.

[0116]

The server device 10 determines "Yes" at step S402 of Fig. 10 and proceeds to step S403 to, as shown in Fig. 12, store history information that associates the session ID "S01," terminal ID "R02" and available reproduction time "14" included in the available reproduction time information with a difference "21" between reproduction start time and present time into the storage device.

[0117]

The server device 10 determines a code rate based on the history information stored in the storage device. In this exemplary embodiment, the server device 10 acquires "38.4 Mbps" as the communication speed B_n based on the equation (4) shown above. Moreover, the server device 10 acquires (determines) "50.4 Mbps" as the code rate r_{n+1} based on the equation (5) shown above (step S403 of Fig. 10).

[0118]

Then, the server device 10 specifies "50 Mbps" as a code rate that is equal to or less than the code rate r_{n+1} and is the closest to the code rate r_{n+1} from among the code rates of the

content data stored in the storage device. Next, the server device 10 changes the code rate of the content data being transmitted to the terminal device 20a, to the specified code rate "50 Mbps" (step S404 of Fig. 10). After that, the server device 10 returns to step S401 to repeatedly execute the abovementioned process.

[0119]

After that, every time the transmission period (the change period) elapses, the server device 10 determines a code rate for each of the terminal devices 20a and 20b transmitting the content data, and changes the code rate of the content data being transmitted to the determined code rate.

[0120]

After that, when the present time reaches the reproduction start time T_s, the terminal device 20a and the terminal device 20b each determine "Yes" at step S304 of Fig. 6 and proceeds to step S307 to start reproduction of content (output of content to the output device) based on the content data stored in the storage device (steps S110a and S110b of Fig. 3).

[0121]

Thus, it is possible to securely match the positions to reproduce the content with each other between the plurality of terminal devices 20a and 20b. That is to say, it is possible to cause the plurality of terminal devices 20a and 20b to reproduce the same content synchronously with each other.

[0122]

Further, at this moment, the server device 10 determines "Yes" at step S401 of Fig. 10 and ends execution of the code rate change control program.

[0123]

Thus, the distribution system 1 changes each of the code rates of the content data transmitted from the server device 10 to the terminal devices 20a and 20b based on both the remaining time and the available reproduction time. Consequently, in a case that the available reproduction time is relatively short and the remaining time is considerably long, the distribution system 1 can set the code rate to a relatively large value. As a result, it is possible to avoid meaninglessly lowering the code rate.

[0124]

Further, in a case that the available reproduction time is relatively long and the remaining time is considerably short, the distribution system 1 can set the code rate to a relatively small value. As a result, it is possible to secure a sufficiently long available reproduction time at the reproduction start time. Therefore, the terminal devices 20a and 20b can each securely start reproduction of the content at the set reproduction start time.

[0125]

Thus, according to the distribution system 1, it is possible to cause each of the terminal devices 20a and 20b to securely start reproduction of the content at the set reproduction start time while avoiding meaninglessly lowering the code rate.

[0126]

Furthermore, the distribution system 1 is configured to determine, as a code rate, a value that becomes smaller as the available reproduction time becomes smaller than the target available reproduction time and that becomes smaller as the remaining time becomes shorter.

Thus, it is possible to make the available reproduction time at the reproduction start time

sufficiently close to the target available reproduction time. As a result, it is possible to cause each of the terminal devices 20a and 20b to securely start reproduction of the content at the set reproduction start time while avoiding meaninglessly lowering the code rate.

[0127]

In addition, the distribution system 1 is configured to acquire a communication speed, which is the data amount of content data transmitted from the server device 10 to each of the terminal devices 20a and 20b per unit time, and determine the result of dividing the result of multiplying the acquired communication speed and the remaining time by the result of subtracting the available reproduction time from the target available reproduction time, as a code rate.

Thus, it is possible to make the available reproduction time at the reproduction start time close to the target available reproduction time with more security.

[0128]

Furthermore, the distribution system 1 is configured to set a reproduction start time based on a target available reproduction time, which is a target value of an available reproduction time.

Thus, it is possible to make an available reproduction time at reproduction start time close to a target available reproduction time with security.

[0129]

In addition, the distribution system 1 is configured to, for each of the plurality of terminal devices 20a and 20b, calculate an each-device reproduction preparation time, which is a time required for the terminal device to start reproduction of content, and set reproduction start

time based on the maximum value of the calculated each-device reproduction preparation time.

[0130]

Consequently, all of the plurality of terminal devices 20a and 20b can securely make a target available reproduction time close to an available reproduction time before reproduction start time. As a result, it is possible to securely match the positions to reproduce content with each other between the plurality of terminal devices 20a and 20b.

[0131]

Furthermore, the distribution system 1 is configured to set reproduction start time based on an activation time, which is a time required for activation of an application program that the terminal devices 20a and 20b each execute to reproduce content, and a target available reproduction time.

Thus, the terminal devices 20a and 20b can each securely start reproduction of content at the reproducible start time.

[0132]

In addition, the distribution system 1 is configured to set reproduction start time based on a communication speed, which is the data amount of content data transmitted from the server device 10 to each of the terminal devices 20a and 20b per unit time, and a target available reproduction time.

Thus, it is possible to properly set the reproduction start time.

[0133]

Assuming, in a state that the terminal devices 20a and 20b reproduce the same content synchronously with each other, the user of the terminal device 20c wants the terminal device 20c

to reproduce the content synchronously with the terminal devices 20a and 20b, the description will be continued.

[0134]

In this case, the user of the terminal device 20c inputs a session participation instruction. Consequently, the terminal device 20c transmits a session participation request including the session ID "S01," terminal ID "R03," activation time "1500" (ms) and communication speed "8" (Mbps) having been received to the server device 10 (step S301 of Fig. 6, step S501 of Fig. 13).

[0135]

Upon reception of the session participation request from the terminal device 20c, the server device 10 adds the activation time and communication speed included in the session participation request to session information including the session ID and terminal ID included in the session participation request among the session information stored in the storage device as shown in Fig. 14.

[0136]

Then, for the terminal device 20c having transmitted the session participation request, the server device 10 specifies a code rate r that is equal to or less than the communication speed and is the closest to the communication speed from among the code rates of the content data stored in the storage device. In this exemplary embodiment, the server device 10 specifies "4 Mbps" as the code rate r for the terminal device 20c.

[0137]

Next, for the terminal device 20c having transmitted the session participation request, the server device 10 calculates the each-device reproduction preparation time T_p based on the

communication speed B and activation time T_a included in the stored session information and the target available reproduction time T_d set in advance (step S203 of Fig. 4).

[0138]

Next, the server device 10 determines the reproduction start time T_s ("13:05:25") based on the calculated each-device reproduction preparation time T_p (step S204 of Fig. 4). Then, as shown in Fig. 15, the server device 10 adds the determined reproduction start time to the session information including the session ID "S01" and the terminal ID "R03."

[0139]

Next, the server device 10 transmits the determined reproduction start time T_s to the terminal device 20c having transmitted the session participation request (step S205 of Fig. 4, step S502 of Fig. 13). Thus, the terminal device 20c receives the reproduction start time T_s from the server device 10 (step S302 of Fig. 6).

[0140]

Then, the server device 10 determines whether the determined reproduction start time T_s is time later than reproduction start time determined based on another session participation request including the same session ID as that of the received session participation request (step S206 of Fig. 4).

[0141]

At this moment, reproduction start time (second reproduction start time) determined based on the session participation request received from the terminal device 20c (a second reception device) is time later than reproduction start time (first reproduction start time) determined based on the session participation requests received from the terminal device 20a (a

first reception device) and the terminal device 20b. Moreover, the session participation requests received from the terminal devices 20a and 20b include the same session ID as the session ID included in the session participation request received from the terminal device 20c. That is to say, the determined reproduction start time T_s is time later than reproduction start time determined based on another session participation request including the same session ID as the received session participation request.

[0142]

Therefore, the server device 10 determines "Yes" and proceeds to step S207 to determine a position behind a head position by a difference between the first reproduction start time and the second reproduction start time, as a transmission start position. Then, the server device 10 proceeds to step S208 and starts transmission of content data from the determined transmission start position to the terminal device 20c (step S503 of Fig. 13).

[0143]

At this moment, content data transmitted by the server device 10 to the terminal device 20c is content data representing content identified by the content ID "C01" included in the session information including the session ID "S01." Moreover, this content data is data coded with a code rate specified based on a communication speed included in the session participation request received from the terminal device 20c.

[0144]

As in the abovementioned case, the terminal device 20c transmits available reproduction time information including an available reproduction time to the server device 10 every time a transmission period elapses (step S504 of Fig. 13).

Then, the server device 10 performs a code rate change control on the terminal device 20c every time receiving available reproduction time information from the terminal device 20c (step S505 of Fig. 13).

[0145]

After that, when the present time reaches the reproduction start time received from the server device 10, the terminal device 20c starts reproduction of content based on the content data stored in the storage device (step S506 of Fig. 13).

[0146]

Consequently, it is possible to securely match the positions to reproduce content with each other among the plurality of terminal devices 20a to 20c. That is to say, it is possible to cause the plurality of terminal devices 20a to 20c to reproduce the same content synchronously with each other.

[0147]

As described above, the distribution system 1 according to the first exemplary embodiment of the present invention makes it possible to cause the terminal devices 20a to 20c to securely start reproduction of content at set reproduction start time while avoiding meaninglessly lowering a code rate.

[0148]

The distribution system 1 according to the first exemplary embodiment is configured so that the server device 10 determines a code rate based on a remaining time and an available reproduction time, but may be configured so that each of the terminal devices 20a to 20c determines a code rate based on a remaining time and an available reproduction time. In this case,

each of the terminal devices 20a to 20c is configured to transmit the determined code rate to the server device 10

[0149]

Further, the distribution system 1 according to the first exemplary embodiment is configured to match the positions to reproduce content to be reproduced by the respective terminal devices 20a to 20c with each other among the terminal devices 20a to 20c, but the positions to reproduce content to be reproduced by the respective terminal devices 20a to 20c may be different from each other.

[0150]

Further, the distribution system 1 according to the first exemplary embodiment may be configured so that content data are transmitted and received among the terminal devices.

Further, the number of the terminal devices included by the distribution system 1 according to the first exemplary embodiment is three, but may be two, four, or more.

[0151]

Each of the functions of the distribution system 1 in the first exemplary embodiment is realized by execution of a program (software) by the CPU, but may be realized by hardware such as a circuit.

[0152]

<Second Exemplary Embodiment>

Next, a communication system according to a second exemplary embodiment of the present invention will be described with reference to Fig. 16.

A distribution system 100 according to the second exemplary embodiment is a system

including a transmission device 110 and a reception device 120 configured to be capable of communicating with each other.

[0153]

The transmission device 110 is equipped with a content transmitting part (a content transmitting means) 111 for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device 120.

The reception device 120 is equipped with a content reproducing part (a content reproducing means) 121 for, while receiving the content data transmitted by the transmission device 110, storing received data of the content data into a storage device and also reproducing the content based on the stored data.

[0154]

The distribution system 100 comprises a code rate determining part (a code rate determining means) 131 for determining the code rate based on a remaining time before reproduction start time set as time at which the reception device 120 starts reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device 120.

[0155]

The content transmitting part 111 is configured to change the code rate of the content data to be transmitted to the reception device 120 to the determined code rate.

The content reproducing means 121 is configured to start reproduction of the content at the set reproduction start time.

[0156]

Accordingly, the distribution system 100 changes a code rate of content data transmitted from the transmission device 110 to the reception device 120 based on both a remaining time and an available reproduction time. Consequently, the distribution system 100 can set the code rate to a relatively large value in a case that the available reproduction time is relatively short and the remaining time is considerably long. As a result, it is possible to avoid meaninglessly lowering the code rate.

[0157]

Further, the distribution system 100 can set the code rate to a relatively small value in a case that the available reproduction time is relatively long and the remaining time is considerably short. As a result, it is possible to secure a sufficiently large available reproduction time at reproduction start time. Therefore, the reception device 120 can securely start reproduction of content at the set reproduction start time.

[0158]

Thus, according to the distribution system 100, it is possible to cause the reception device 120 to securely start reproduction of the content at the set reproduction start time while avoiding meaninglessly lowering the code rate.

[0159]

In this case, it is preferred that the code rate determining means is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

[0160]

Accordingly, it is possible to make the available reproduction time at the reproduction start time close to a target available reproduction time with sufficiency. As a result, it is possible to cause the reception device to securely start reproduction of the content at the set reproduction start time while avoiding meaninglessly lowering the code rate.

[0161]

In this case, it is preferred that the code rate determining means is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

[0162]

The degree of increase of the available reproduction time varies with a communication speed. Therefore, by configuring the distribution system as described above, it is possible to more securely make the available reproduction time at the reproduction start time close to the target available reproduction time.

[0163]

In this case, it is preferred that the code rate determining means is configured to determine the code rate with every change period set in advance.

[0164]

In this case, it is preferred that the distribution system includes a plurality of the

reception devices and comprises a synchronous reproduction controlling means for matching reproduction positions of the content to be reproduced by the plurality of the reception devices, respectively, with each other among the plurality of the reception devices.

[0165]

Accordingly, it is possible to securely match positions to reproduce the content with each other among a plurality of reception devices.

[0166]

In this case, it is preferred that the distribution system comprises a reproduction start time setting means for setting the reproduction start time based on a target available reproduction time, which is a target value of the available reproduction time.

[0167]

As the target available reproduction time increases, a time required for the available reproduction time to coincide with the target available reproduction time increases. Therefore, as in the configuration described above, by setting the reproduction start time based on the target available reproduction time, it is possible to securely make the available reproduction time at the reproduction start time close to the target available reproduction time.

[0168]

In this case, it is preferred that the content transmitting means is configured to, when second reproduction start time, which is reproduction start time set for a second reception device as one of the plurality of the reception devices, is later than first reproduction start time, which is reproduction start time set for a first reception device as another one of the plurality of the reception devices, estimate a reproduction position of the content being reproduced by the first

reception device at the second reproduction start time and transmit a portion of the content data at and after the estimated reproduction position to the second reception device.

[0169]

In this case, it is preferred that the reproduction start time setting means is configured to, for each reception device of the plurality of the reception devices, calculate an each-device reproduction preparation time as a time required for the reception device to start reproduction of the content and set the reproduction start time based on a maximum value of the calculated each-device reproduction preparation time.

[0170]

Reception speeds often vary with reception devices. Therefore, by configuring the distribution system as described above, all of the reception devices can securely make the available reproduction times close to the target available reproduction times. As a result, it is possible to securely match positions to reproduce the content with each other among the reception devices.

[0171]

In this case, it is preferred that the reproduction start time setting means is configured to set the reproduction start time based on an activation time, which is a time required for activation of an application program to be executed by the reception device for reproduction of the content, and the target available reproduction time.

[0172]

A time required for the reception device to start reproduction of the content includes an activation time and a time required for the available reproduction time to reach the target

available reproduction time. Therefore, by configuring the distribution system as described above, it is possible to cause the reception device to securely start reproduction of the content at the reproduction start time.

[0173]

In this case, it is preferred that the reproduction start time setting means is configured to set the reproduction start time based on a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time, and the target available reproduction time.

[0174]

The time required for the available reproduction time to reach the target available reproduction time varies with the communication speed. Therefore, by configuring the distribution system as described above, it is possible to properly set the reproduction start time.

[0175]

Further, a distribution method of another exemplary embodiment of the present invention is a method that is applied to a distribution system including a transmission device and a reception device configured to be capable of communicating with each other and that comprises:

transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device, by the transmission device;

while receiving the content data transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the

stored data, by the reception device;

determining the code rate based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device;

changing the code rate of the content data to be transmitted to the reception device to the determined code rate, by the transmission device; and

starting reproduction of the content at the set reproduction start time, by the reception device.

[0176]

In this case, it is preferred that the distribution method comprises determining a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

[0177]

In this case, it is preferred that the distribution method comprises:

acquiring a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time; and

determining a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

[0178]

In this case, it is preferred that the distribution method comprises determining the code rate with every change period set in advance.

[0179]

In this case, it is preferred that the distribution method is applied to the distribution system including a plurality of the reception devices and comprises matching reproduction positions of the content to be reproduced by the plurality of the reception devices, respectively, with each other among the plurality of the reception devices.

[0180]

Further, a transmission device of another exemplary embodiment of the present invention is a device configured to be capable of communicating with a reception device.

The transmission device comprises a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device.

The content transmitting means is configured to change the code rate of the content data to be transmitted to the reception device to a code rate determined based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

[0181]

In this case, it is preferred that the transmission device comprises a code rate determining means for determining the code rate based on the remaining time and the available

reproduction time.

[0182]

In this case, it is preferred the code rate determining means is configured to determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

[0183]

In this case, it is preferred that the code rate determining means is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

[0184]

In this case, it is preferred that the code rate determining means is configured to determine the code rate with every change period set in advance.

[0185]

Further, a program of another exemplary embodiment of the present invention comprises instructions for causing a transmission device configured to be capable of communicating with a reception device to realize a content transmitting means for transmitting content data, which is one content coded with any one code rate of a plurality of code rates different from each other, to the reception device.

The content transmitting means is configured to change the code rate of the content data to be transmitted to the reception device to a code rate determined based on a remaining time before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device.

[0186]

Further, a reception device of another exemplary embodiment of the present invention is a device configured to be capable of communicating with a transmission device.

The reception device comprises:

a content reproducing means for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means for determining the code rate based on a remaining time before reproduction start time set as time to start reproduction of the content from a present moment, and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device.

The content reproducing means is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

[0187]

In this case, it is preferred that the code rate determining means is configured to

determine a value becoming smaller as the available reproduction time becomes shorter than a target available reproduction time, which is a target value of the available reproduction time, and becoming smaller as the remaining time becomes shorter, as the code rate.

[0188]

In this case, it is preferred that the code rate determining means is configured to acquire a communication speed, which is a data amount of the content data transmitted from the transmission device to the reception device per unit time, and determine a value of a result of dividing a value of a result of multiplying the acquired communication speed and the remaining time by a value of a result of subtracting the available reproduction time from the target available reproduction time, as the code rate.

[0189]

In this case, it is preferred that the code rate determining means is configured to determine the code rate with every change period set in advance.

[0190]

A program of another exemplary embodiment of the present invention comprises instructions for causing a reception device configured to be capable of communicating with a transmission device to realize:

a content reproducing means for, while receiving content data, which is one content coded with any one code rate of a plurality of code rates different from each other and is transmitted by the transmission device, storing received data of the content data into a storage device and also reproducing the content based on the stored data; and

a code rate determining means for determining the code rate based on a remaining time

before reproduction start time set as time at which the reception device starts reproduction of the content from a present moment and based on an available reproduction time, which is a time available for reproducing the content based on the content data stored in the storage device of the reception device

The content reproducing means is configured to receive content data coded with the determined code rate and start reproduction of the content at the set reproduction start time.

[0191]

Inventions of a distribution method, a transmission device, a program and a reception device having the aforementioned configurations have the same actions as the distribution system described above, and therefore, can achieve the object of the present invention mentioned above.

[0192]

Although the present invention has been described with reference to the exemplary embodiments, the present invention is not limited to the exemplary embodiments. The configuration and details of the present invention can be altered in various manners that can be understood by those skilled in the art within the scope of the present invention.

[0193]

Further, the program is stored in the storage device in the respective exemplary embodiments, but may be stored in a computer-readable storage medium. For example, the recording medium is a portable medium such as a flexible disk, an optical disk, a magneto-optical disk and a semiconductor memory.

[0194]

Further, as modified examples of the exemplary embodiments, any combination of the exemplary embodiments and modified examples may be employed.

[0195]

The present invention is based upon and claims the benefit of priority from Japanese patent application No. 2009-253581, filed on November 5, 2009, the disclosure of which is incorporated herein in its entirety by reference.

INDUSTRIAL APPLICABILITY

[0196]

The present invention can be applied to, for example, a distribution system that transmits content data representing content from a transmission device to a reception device.

DESCRIPTION OF REFERENCE NUMERALS

[0197]

1 distribution system

10 server device

20a, 20b, 20c terminal device

31 request transmission part

32 synchronous reproduction controlling part

32a reproduction start time reception part

33 content reproducing part

33a content reception part

33b buffer part

33c content reproduction execution part

34 available reproduction time transmission part

41 request reception part

42 session information storage part

43 reproduction start time setting part

43a reproduction start time determination part

43b reproduction start time transmission part

44 content data storage part

45 content transmitting part

46 available reproduction time reception part

47 code rate determining part

100 distribution system

110 transmission device

111 content transmitting part

120 reception device

121 content reproducing part

131 code rate determining part

NW communication line

Fig.1

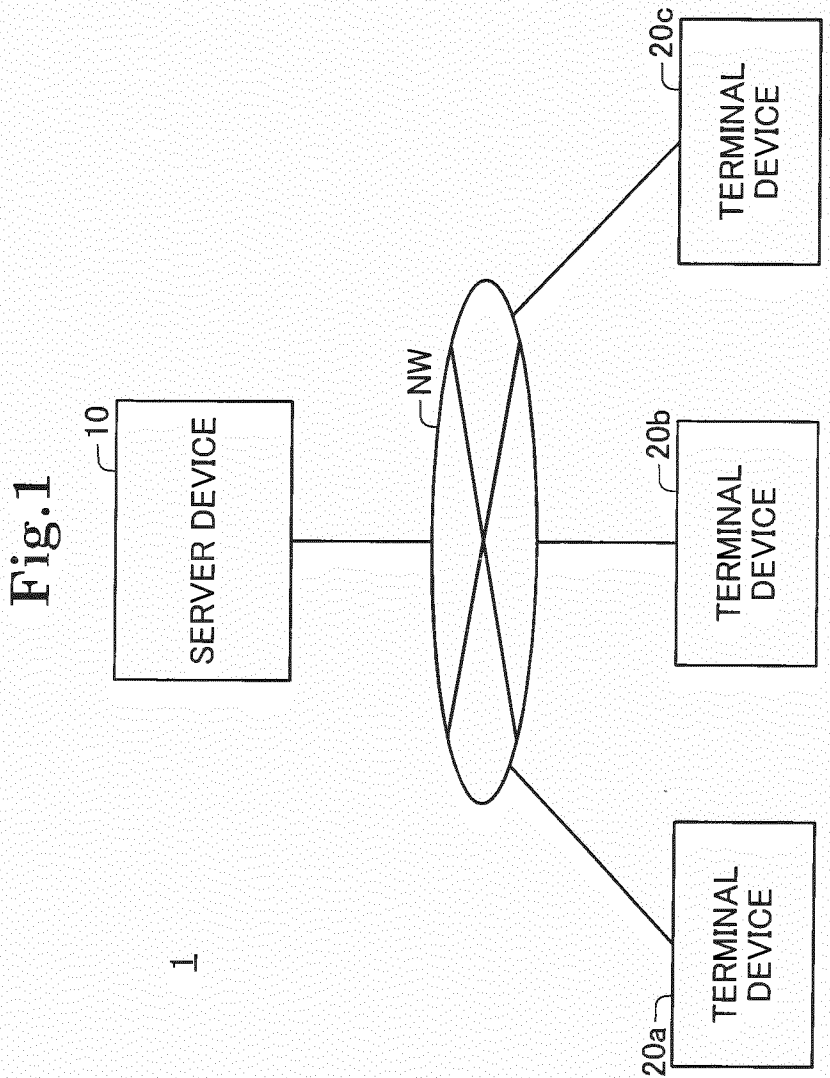

1
SERVER DEVICE
10
NW
TERMINAL DEVICE
20a
TERMINAL DEVICE
20b
TERMINAL DEVICE
20c

Fig.2

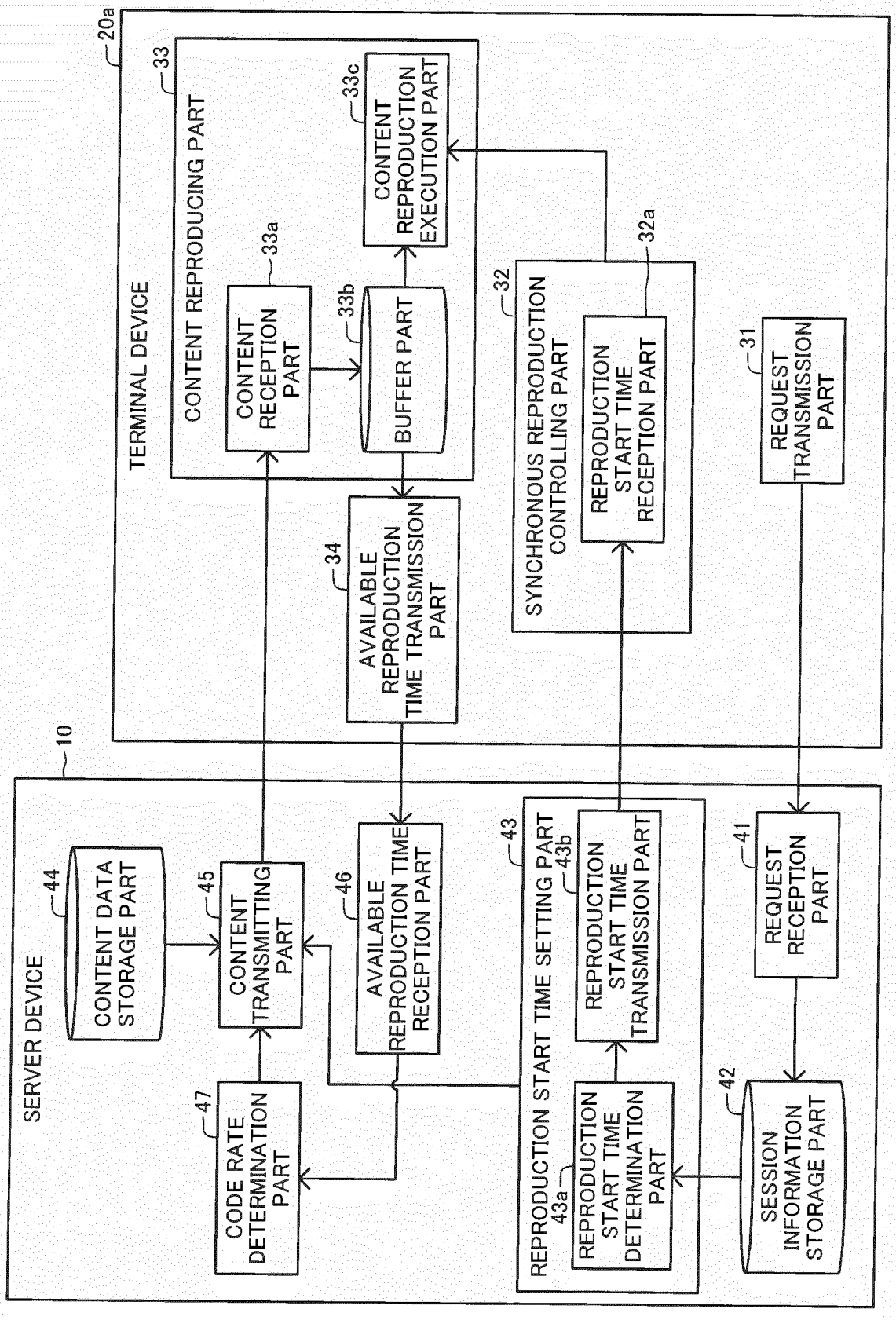

20a
TERMINAL DEVICE
33
CONTENT REPRODUCING PART
33a
CONTENT RECEPTION PART
33b
BUFFER PART
33c
CONTENT REPRODUCTION EXECUTION PART
34
AVAILABLE REPRODUCTION TIME TRANSMISSION PART
32
SYNCHRONOUS REPRODUCTION CONTROLLING PART
32a
REPRODUCTION START TIME RECEPTION PART
31
REQUEST TRANSMISSION PART
10
SERVER DEVICE
44
CONTENT DATA STORAGE PART
45
CONTENT TRANSMITTING PART
46
AVAILABLE REPRODUCTION TIME RECEPTION PART
43
REPRODUCTION START TIME SETTING PART
43b
REPRODUCTION START TIME TRANSMISSION PART
41
REQUEST RECEPTION PART
47
CODE RATE DETERMINATION PART
43a
REPRODUCTION START TIME DETERMINATION PART
42
SESSION INFORMATION STORAGE PART

Fig.3

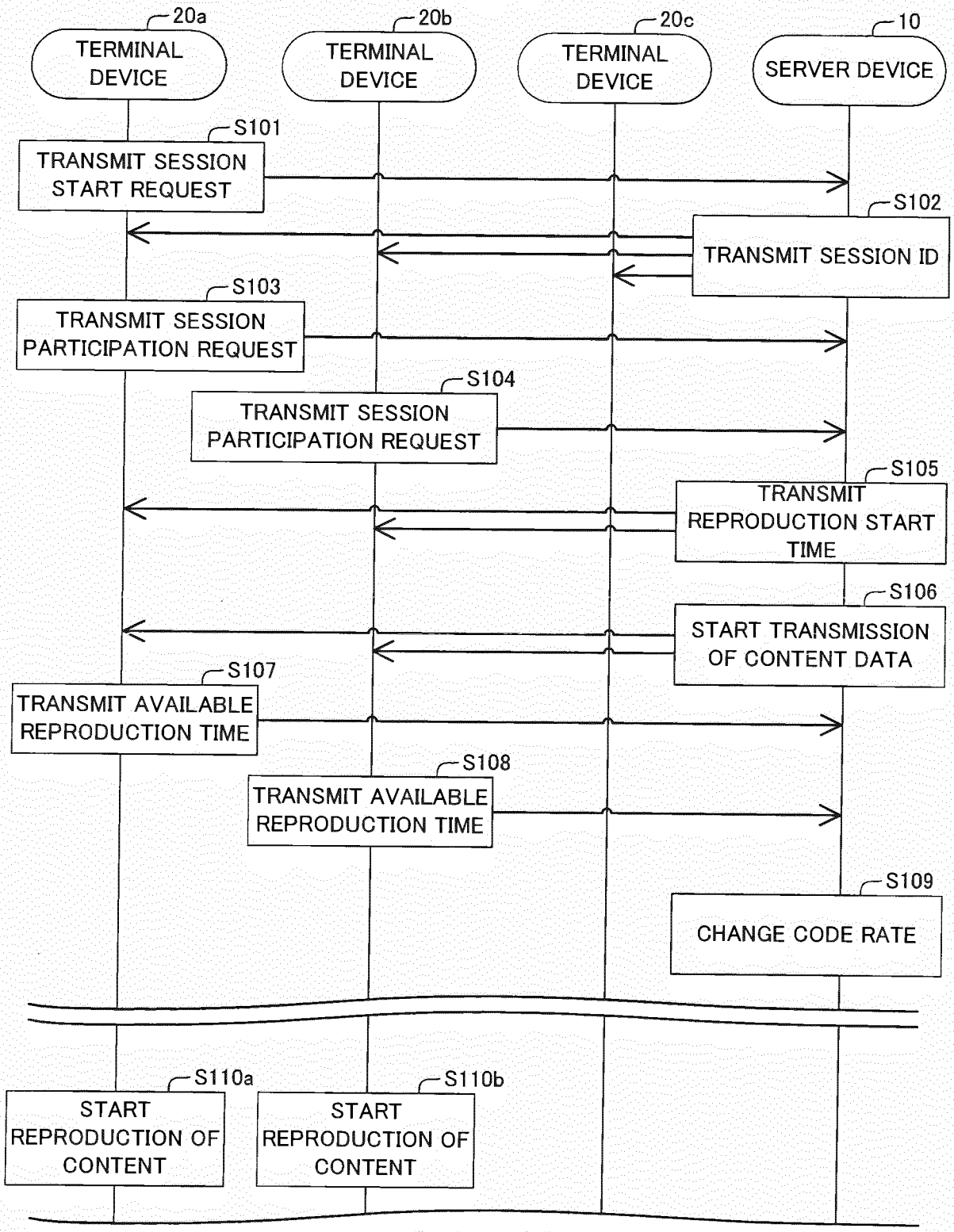

20a
TERMINAL DEVICE
20b
TERMINAL DEVICE
20c
TERMINAL DEVICE
10
SERVER DEVICE
S101
TRANSMIT SESSION START REQUEST
S102
TRANSMIT SESSION ID
S103
TRANSMIT SESSION PARTICIPATION REQUEST
S104
TRANSMIT SESSION PARTICIPATION REQUEST
S105
TRANSMIT REPRODUCTION START TIME
S106
START TRANSMISSION OF CONTENT DATA
S107
TRANSMIT AVAILABLE REPRODUCTION TIME
S108
TRANSMIT AVAILABLE REPRODUCTION TIME
S109
CHANGE CODE RATE
S110a
START REPRODUCTION OF CONTENT
S110b
START REPRODUCTION OF CONTENT

Fig.4

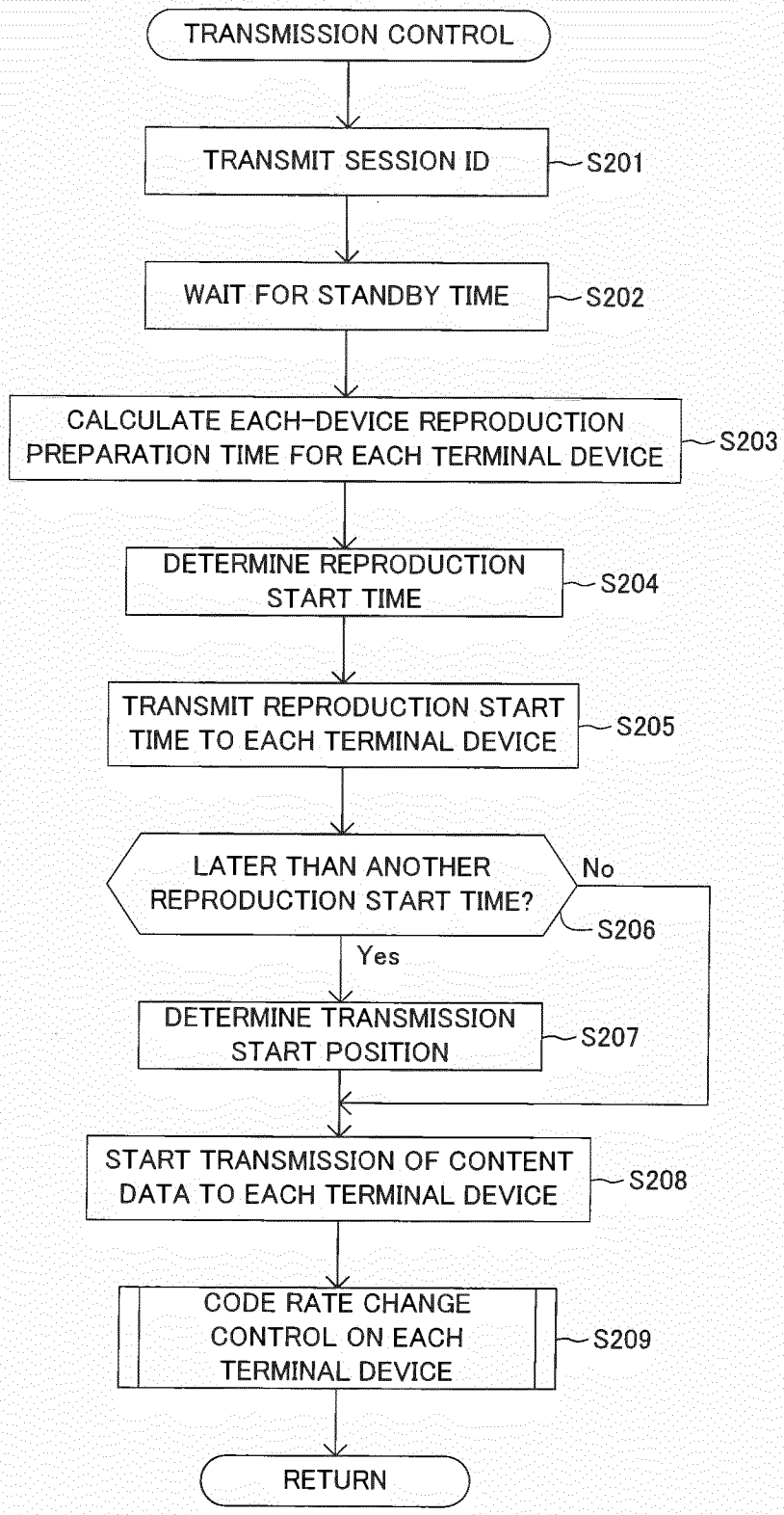

TRANSMISSION CONTROL
TRANSMIT SESSION ID
S201
WAIT FOR STANDBY TIME
S202
CALCULATE EACH-DEVICE REPRODUCTION PREPARATION TIME FOR EACH TERMINAL DEVICE
S203
DETERMINE REPRODUCTION START TIME
S204
TRANSMIT REPRODUCTION START TIME TO EACH TERMINAL DEVICE
S205
LATER THAN ANOTHER REPRODUCTION START TIME?
No
S206
Yes
DETERMINE TRANSMISSION START POSITION
S207
START TRANSMISSION OF CONTENT DATA TO EACH TERMINAL DEVICE
S208
CODE RATE CHANGE CONTROL ON EACH TERMINAL DEVICE
S209
RETURN

Fig.5

SESSION ID	CONTENT ID	TERMINAL ID	ACTIVATION TIME	COMMUNICATION SPEED	REPRODUCTION START TIME
S01	C01	R01			
S01	C01	R02			
S01	C01	R03			
⋮	⋮	⋮	⋮	⋮	⋮

Fig.6

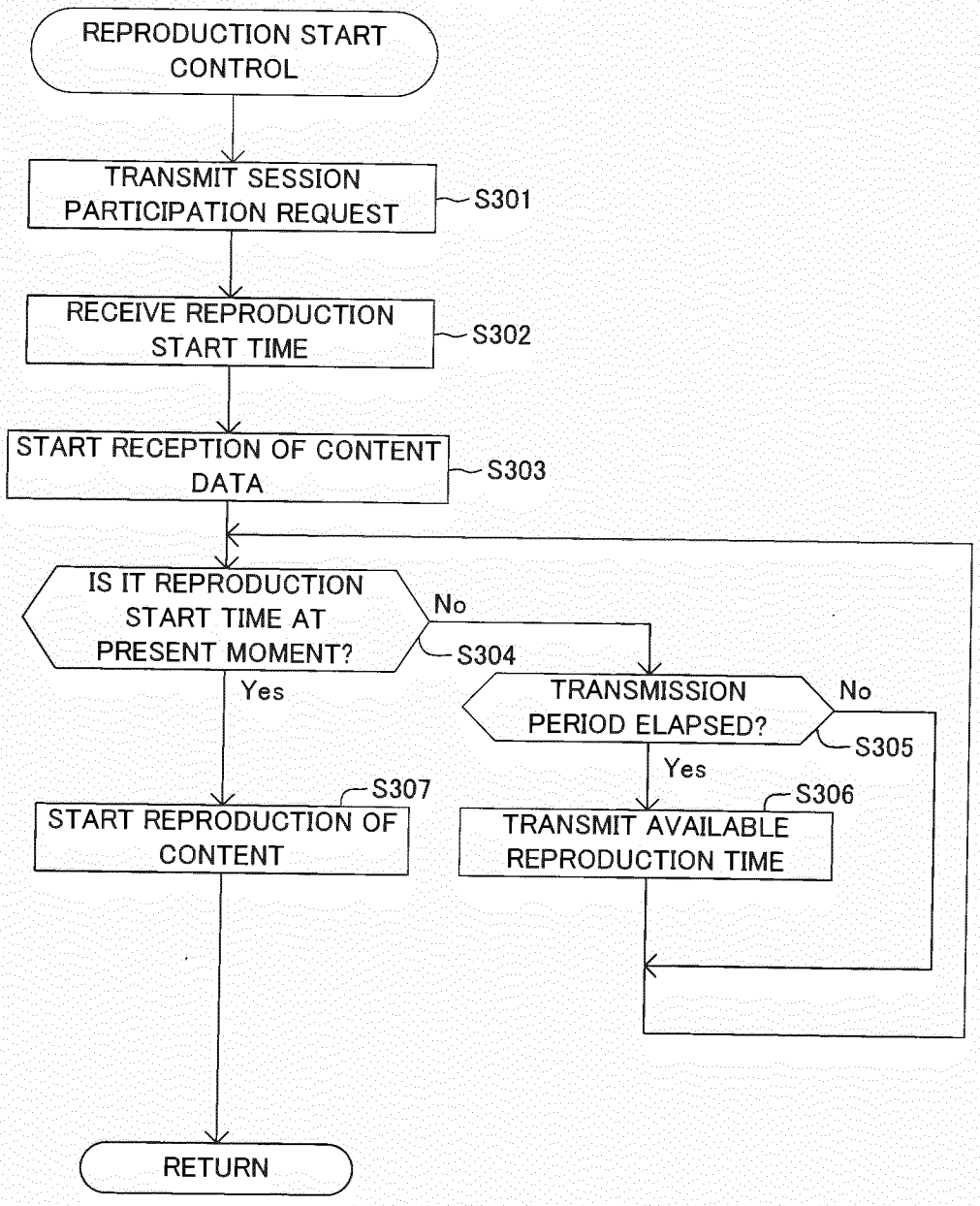

REPRODUCTION START CONTROL
TRANSMIT SESSION PARTICIPATION REQUEST
S301
RECEIVE REPRODUCTION START TIME
S302
START RECEPTION OF CONTENT DATA
S303
IS IT REPRODUCTION START TIME AT PRESENT MOMENT?
No
S304
Yes
TRANSMISSION PERIOD ELAPSED?
No
S305
Yes
S306
TRANSMIT AVAILABLE REPRODUCTION TIME
S307
START REPRODUCTION OF CONTENT
RETURN

Fig.7

SESSION ID	CONTENT ID	TERMINAL ID	ACTIVATION TIME	COMMUNICATION SPEED	REPRODUCTION START TIME
S01	C01	R01	1200	3	
S01	C01	R02	1000	50	
S01	C01	R03			
⋮	⋮	⋮	⋮	⋮	⋮

Fig.8

SESSION ID	CONTENT ID	TERMINAL ID	ACTIVATION TIME	COMMUNICATION SPEED	REPRODUCTION START TIME
S01	C01	R01	1200	3	13:01:34
S01	C01	R02	1000	50	13:01:34
S01	C01	R03			
⋮	⋮	⋮	⋮	⋮	⋮

Fig.9

SESSION ID	TERMINAL ID	AVAILABLE REPRODUCTION TIME	REMAINING TIME	CODE RATE
S01	R01	0	31	2
S01	R02	0	31	50
⋮	⋮	⋮	⋮	⋮

Fig.10

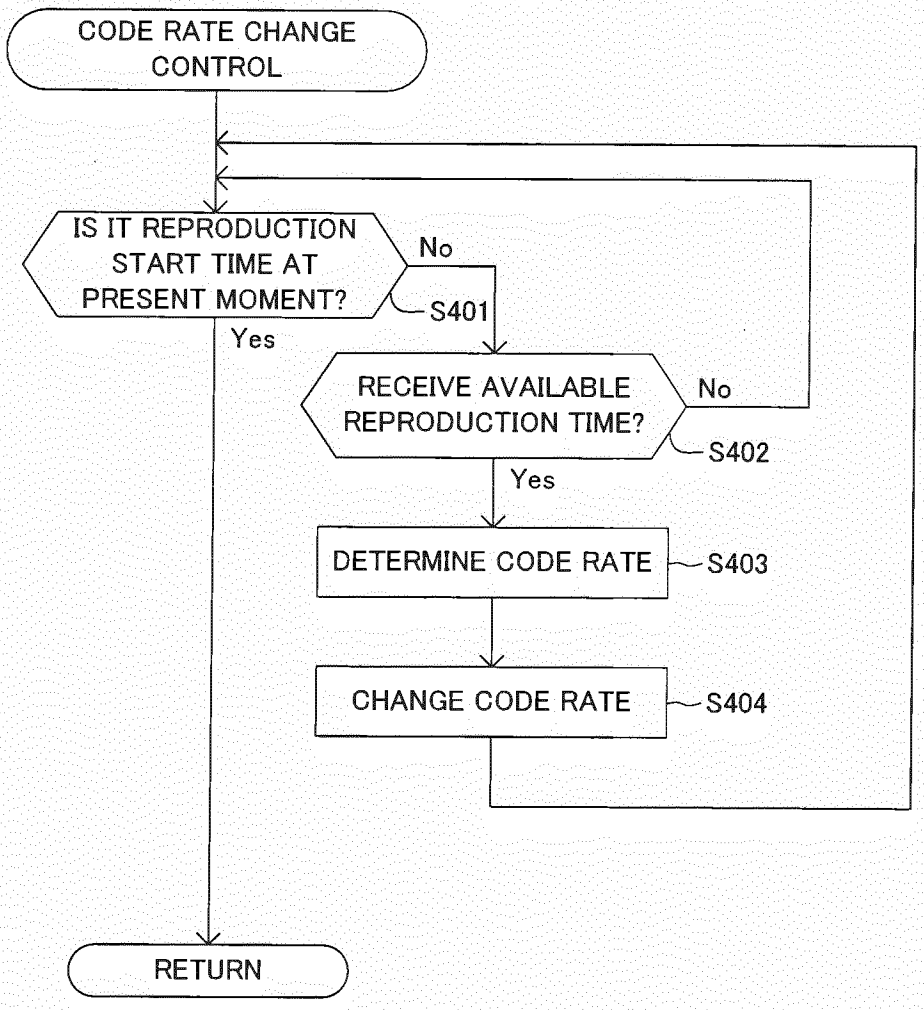

CODE RATE CHANGE CONTROL
IS IT REPRODUCTION START TIME AT PRESENT MOMENT?
No
S401
Yes
RECEIVE AVAILABLE REPRODUCTION TIME?
No
S402
Yes
DETERMINE CODE RATE
S403
CHANGE CODE RATE
S404
RETURN

Fig.11

SESSION ID	TERMINAL ID	AVAILABLE REPRODUCTION TIME	REMAINING TIME	CODE RATE
S01	R01	0	31	2
S01	R02	0	31	50
S01	R01	7	26	2
S01	R02	2	26	16
⋮	⋮	⋮	⋮	⋮

Fig.12

SESSION ID	TERMINAL ID	AVAILABLE REPRODUCTION TIME	REMAINING TIME	CODE RATE
S01	R01	0	31	2
S01	R02	0	31	50
S01	R01	7	26	2
S01	R02	2	26	16
S01	R01	18	21	4
S01	R02	14	21	50
⋮	⋮	⋮	⋮	⋮

Fig.13

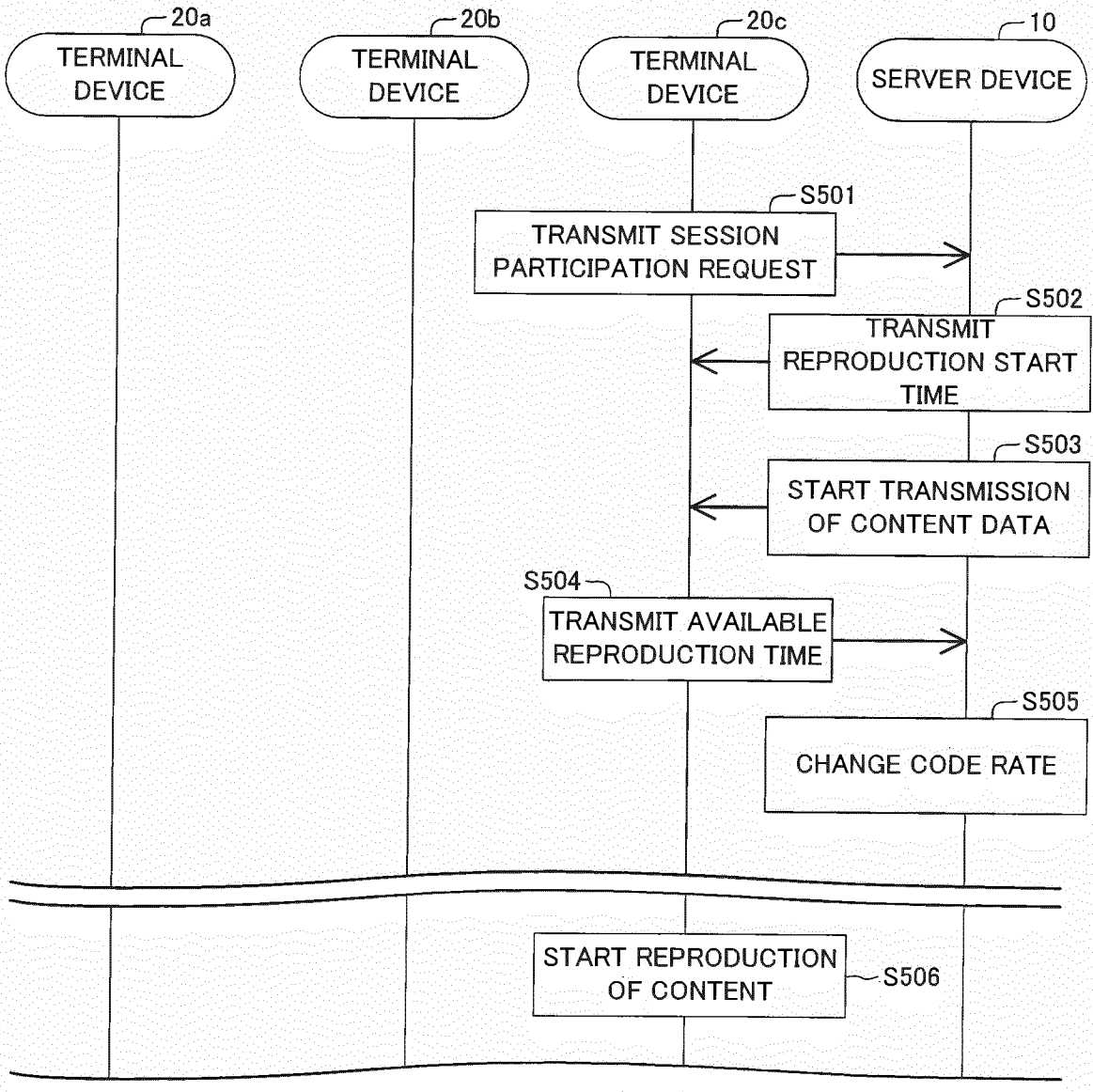

20a
TERMINAL DEVICE
20b
TERMINAL DEVICE
20c
TERMINAL DEVICE
10
SERVER DEVICE
S501
TRANSMIT SESSION PARTICIPATION REQUEST
S502
TRANSMIT REPRODUCTION START TIME
S503
START TRANSMISSION OF CONTENT DATA
S504
TRANSMIT AVAILABLE REPRODUCTION TIME
S505
CHANGE CODE RATE
START REPRODUCTION OF CONTENT
S506

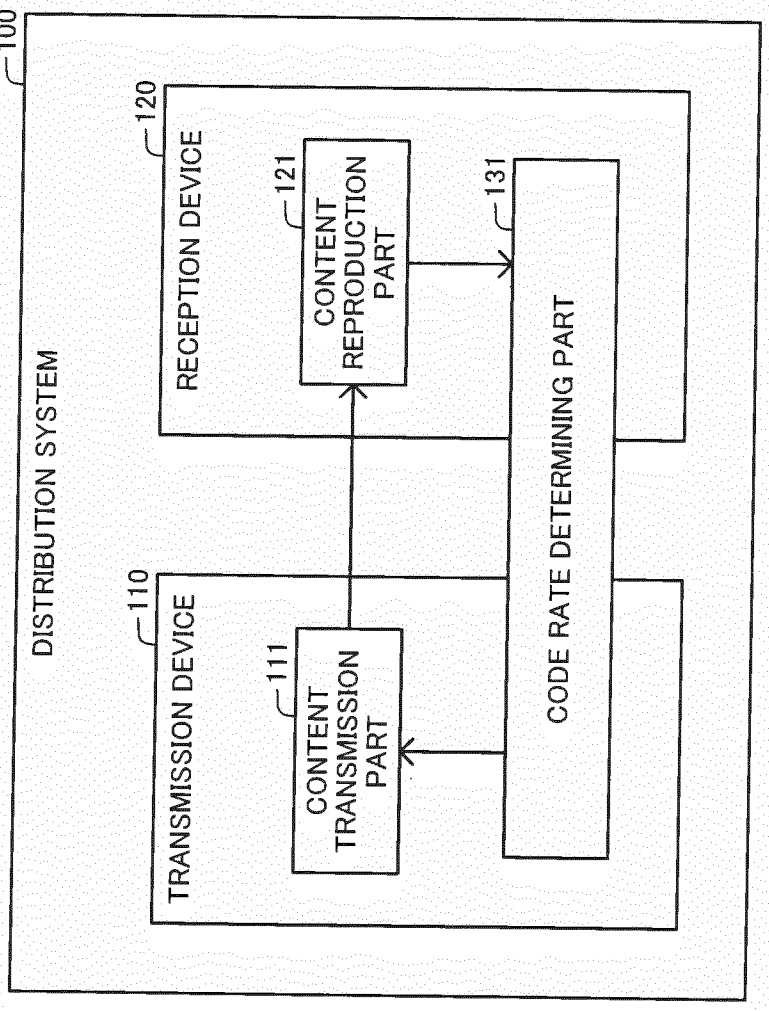
Fig.14

SESSION ID	CONTENT ID	TERMINAL ID	ACTIVATION TIME	COMMUNICATION SPEED	REPRODUCTION START TIME
S01	C01	R01	1200	3	13:01:34
S01	C01	R02	1000	50	13:01:34
S01	C01	R03	1500	8	
⋮	⋮	⋮	⋮	⋮	⋮

Fig.15

SESSION ID	CONTENT ID	TERMINAL ID	ACTIVATION TIME	COMMUNICATION SPEED	REPRODUCTION START TIME
S01	C01	R01	1200	3	13:01:34
S01	C01	R02	1000	50	13:01:34
S01	C01	R03	1500	8	13:05:25
⋮	⋮	⋮	⋮	⋮	⋮

Fig.16


100
DISTRIBUTION SYSTEM
120
RECEPTION DEVICE
121
CONTENT REPRODUCTION PART
131
CODE RATE DETERMINING PART
110
TRANSMISSION DEVICE
111
CONTENT TRANSMISSION PART

Europäisches Patentamt
European Patent Office
Office européen des brevets

Entry into the European phase (EPO as designated or elected Office)

To the European Patent Office

European application number	EP10828052.0
PCT application number	PCT/JP2010/006067
PCT publication number	WO2011055490
Applicant's or representative's reference	NBA 038 WO/EP
International Filing Date	13.10.2010
International Searching Authority (ISA)	JP
International Preliminary Examining Authority (IPEA)	not applicable

1. Applicant

Indications concerning the applicant(s) are contained in the international publication or were recorded by the International Bureau after the international publication. ☒

Changes which have not yet been recorded by the International Bureau are set out here: ☐

2. Representative

This is the representative who will be listed in the Register of European Patents and to whom notifications will be made

Representative 1

Name:	Betten & Resch
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Fax:	0049-89-2607896
e-mail:	mail@bettenpat.com

Representative 2

Name:	Schöniger, Mr. Franz-Josef
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	Germany
Telephone:	0049-89-242417-0
Fax:	0049-89-2607896
e-mail:	mail@bettenpat.com

3. Authorisation

An individual authorisation is attached. ☐

A general authorisation has been registered under No: ☐

A general authorisation has been filed, but not yet registered. ☐

The authorisation filed with the EPO as PCT receiving Office expressly includes the European phase. ☐

4. Request for examination

Examination of the application under Art. 94 EPC is hereby requested. The examination fee is being (has been, will be) paid. ☒

Request for examination in an admissible non-EPO language: ☐

The applicant waives his right to be asked under Rule 70(2) EPC whether he wishes to proceed further with the application. ☐

5. Copies

Additional sets of copies of the documents cited in the supplementary European search report are requested.	☒
Number of additional sets of copies	1
6. Documents intended for proceedings before the EPO	
Number of claims on entry into the European phase:	26
6.1 Proceedings before the EPO as designated Office (PCT I) are to be based on the following documents:	
the application documents published by the International Bureau (with all claims, description and drawings), where applicable with amended claims under Art. 19 PCT	☒
unless replaced by the amendments attached.	☐
Where necessary, clarifications should be attached as `Other documents`	
6.2 Proceedings before the EPO as elected Office (PCT II) are to be based on the following documents:	
the documents on which the international preliminary examination report is based, including any annexes	☐
unless replaced by the amendments attached.	☐
Where necessary, clarifications should be attached as `Other documents`	
If the EPO as International Preliminary Examining Authority has been supplied with test reports, these may be used as the basis of proceedings before the EPO.	☐
6.3 A copy of the results of the search carried out by the authority with which the previous application(s) whose priority is claimed was (were) filed is attached (R. 141(1) EPC).	☐
6.4 The applicant waives his right to the communication under Rules 161(1) or (2) and 162 EPC.	☐
7. Translations	
Translations in one of the official languages of the EPO (English, French, German) are attached as crossed below:	☒
** In proceedings before the EPO as designated or elected Office (PCT I + II):*	
Translation of the international application (description, claims, any text in the drawings) as originally filed, of the abstract as published and of any indication under Rule 13bis.3 and 13bis.4 PCT regarding biological material	☒
Translation of the priority application(s) (to be filed only at the EPO's request, Rule 53(3) EPC)	☐
It is hereby declared that the international application as originally filed is a complete translation of the previous application (Rule 53(3) EPC)	☐
** In addition, in proceedings before the EPO as designated Office (PCT I):*	
Translation of amended claims and any statement under Art. 19 PCT, if the claims as amended are to form the basis for the proceedings before the EPO (see Section 6).	☐
** In addition, in proceedings before the EPO as elected Office (PCT II):*	
Translation of annexes to the international preliminary examination report	☐
8. Biological material	
The invention uses and/or relates to biological material deposited under Rule 31 EPC.	☐
The particulars referred to in Rule 31(1)(c) EPC (if not yet known, the depositary institution and the identification reference(s)) [number, symbols, etc.] of the depositor) are given in the international publication or in the translation submitted in Section 7 on:	☐
page(s) / line(s)	
The receipt(s) of deposit issued by the depositary institution	
is (are) enclosed.	☐
will be filed later.	☐
Waiver of the right to an undertaking from the requester pursuant to Rule 33(2) EPC attached.	☐
9. Nucleotide and amino acid sequences	
The international application contains a sequence listing as part of the description	☐

9.1 The sequence listing was filed under Rule 5.2(a) PCT, or furnished to the EPO as ISA under Rule 13ter.1(a) PCT, or is otherwise available to the EPO, in computer-readable format in accordance with WIPO ST.25.	☐
9.2	
The sequence listing is attached in computer-readable format in accordance with WIPO Standard ST.25	☐
The sequence listing is attached in PDF format.	☐
The sequence listing does not include matter which goes beyond the content of the application as filed.	☐
10. Designation fees	
All the contracting states party to the EPC at the time of filing of the international patent application and designated in the international application are deemed to be designated (see Article 79(1) EPC).	☒
The following states, which were contracting states to the EPC at the time of filing of the international application, are designated:	
AL AT BE BG CH&LI CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR	
11. Extension of the European patent	
This application is deemed to be a request to extend the European patent application and the European patent granted in respect of it to all the non-contracting states to the EPC designated in the international application and with which extension agreements are in force on the date on which the international application is filed. However, the extension only takes effect if the prescribed extension fee is paid.	☐
It is currently intended to pay the extension fee for the following states:	
Note: Under the automatic debiting procedure, extension fees will only be debited for states indicated here, unless the EPO is instructed otherwise before expiry of the period for payment.	

12. List of enclosed documents

	Description of document	Original file name	Assigned file name
1	Combined Translations	NBA038WOEP Translation.pdf	SPECTRANEPO-1.pdf

13. Mode of payment: Automatic debit order	☒
Currency	EUR
The European Patent Office is hereby authorised, under the Arrangements for the automatic debiting procedure, to debit from the deposit account indicated any fees and costs falling due.	
Deposit account number	28000531
Account holder	Betten & Resch
14. Any refunds should be made to the following EPO deposit account:	☒
Number and account holder	Betten & Resch, 28000531
15. Fees	
16. Annotations	
16-1. Note (for EPO) (EP Phase)	Printing Fee (Franz-Josef Schöniger) The EPO is requested to debit our account with the correct page fee of EUR 322,- for 23 pages more than 35.
17. Signature(s) of applicant(s) or representative	

Place:

Date: **04 May 2012**

Signed by: **DE, Betten & Resch, F.-J. Schöniger 2439**

Capacity: **(Representative)**

Table for section 6 of Form 1200.3

In accordance with the Notice from the European Patent Office dated 26 January 2009 concerning the 2009 fee structure (OJ EPO 2009, 118, and Guidelines for Examination in the EPO, April 2009, A-III, 13.2), the amount of the additional fee (Art. 2, item 1a, Rules relating to Fees) for the pages of this European patent application is calculated as follows:

Documents intended for proceedings before the EPO (R. 159 (1) (b) EPC) and for calculating the additional fee (Art. 2, item 1a, RFees):

		Page(s) from ... to ...	Number of pages
Description:	International application as published	1-40	40
Claims:	International application as published	41-48	8
Drawings:	International application as published	49-57	9
Abstract:	Default count: one page		1
Total number of pages			58
Fee-exempt pages (Art. 2, item 1a, RFees)			-35
Number of pages to be paid for			23
			(x 13 EUR per page)
Total amount payable		EUR	299

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
Postbus 5818
2280 HV RIJSWIJK
NETHERLANDS
Tel. +31 (0)70 340-2040
Fax +31 (0)70 340-3016

For any questions about this communication:
Tel.:+31 (0)70 340 45 00

BABA, Motohiro et al.
2nd Floor, Ishii Bldg., 25-1, Sugawara-machi,
Kawagoe-shi, Saitama
3500046
JAPON

Date
16.03.12

Reference	Application No./Patent No.
	10828052.0 - 1241 PCT/JP2010006067
Applicant/Proprietor	
NEC Corporation	

Entry into the European phase before the European Patent Office

The following information describes the procedural steps required for entry into the European phase before the European Patent Office (EPO). You are advised to read it carefully because failure to take the necessary action in due time can lead to a loss of rights.

1. The above mentioned international patent application has been given the **European application No. 10828052.0**.

2. Applicants **without a residence or their principal place of business** in an EPC Contracting State may themselves initiate European processing of their international applications, provided they do so before expiry of the 31st month from the priority date.

   During the European phase before the EPO as designated or elected Office, however, such applicants **must** be represented by a professional representative (Art. 133(2) and Art. 134(1) and (8) EPC).

   Where, at the expiry of the time period laid down in Rule 163(5) EPC, the requirements of Article 133(2) EPC have not been complied with, the European patent application will be **refused**, pursuant to Rule 163(6) EPC.

   Please note that a professional representative authorised to act before the EPO and who acted for the applicant during the international phase does not automatically become the representative for the European phase. Applicants are therefore strongly advised to appoint in good time any representative they wish to initiate the European phase for them; otherwise the EPO has to send all communications directly to the applicant.

3. Applicants **with a residence or their principal place of business** in an EPC Contracting State are not obliged to appoint for the European phase a professional representative authorised to act before the EPO. However, in view of the complexity of the procedure it is recommended that they do so.

4. Applicants and professional representatives are also strongly advised to initiate the European phase using **EPO Form 1200**. It is available free of charge from the EPO or via the EPO website at **www.epo.org**. Similarly, it can be or generated with the Online Filing software, obtainable free of charge from the EPO (**www.epoline.org**) The use of the form is not compulsory.

5. Where the EPO acts as designated or elected Office (Art. 22(1) and (3) and 39(1) PCT), to enter the European phase before the EPO, the **following acts** must be performed by the applicant within **31 months** from the date of filing of the international application or (where applicable) the earliest priority date:

   a) Supply a translation of the international application into an EPO official language, if the International Bureau did not publish the application in such language (Art. 22(1) PCT and R. 159(1)(a) EPC);

   b) Specify the application documents, as originally filed or as amended, on which the European grant procedure is to be based (R. 159(1)(b) EPC);

   c) Pay the filing fee and, where applicable, the additional fee for a European patent application comprising more than 35 pages (R. 159(1)(c) EPC, Art. 2, items 1, 1a Rules relating to Fees);

   d) Pay the search fee where a supplementary European search report has to be drawn up (R. 159(1)(e) EPC);

   e) Pay the designation fee if the time limit laid down in Rule 39(1) EPC (i.e. six months after publication of the international search report) has expired before the 31-month period pursuant to Rule 159(1) EPC (R. 159(1)(d) EPC);

   f) File the written request for examination and pay the examination fee if the time limit laid down in Rule 70(1) EPC has expired before the 31-month period pursuant to Rule 159(1) EPC (R. 159(1)(f) EPC);

   g) Pay the renewal fee in respect of the third year, if the fee has fallen due (see Rule 51(1) EPC) before expiry of the 31-month period pursuant to Rule 159(1) EPC (R. 159(1)(g) EPC);

   h) File, where applicable, the certificate of exhibition referred to in Article 55(2) and Rule 25 EPC (R. 159(1)(h) EPC);

   i) Pay the claims fees for the sixteenth and each subsequent claim when the application documents on which the European grant procedure is to be based comprise more than fifteen claims (R. 162(1) EPC). For applications entering the European phase on or after 1 April 2009, a higher amount is payable for the 51st and each subsequent claim (Decision of the Administrative Council of 14 December 2007 amending the Rules relating to Fees, OJ EPO 2008, 10).

   If either the translation of the international application or the request for examination is not filed in time, or if the filing fee, the additional fee, the search fee, the designation fee or the examination fee is not paid in due time, the application shall be deemed to be withdrawn (R. 160(1) EPC).

6. Payment of fees

   An up-to-date guidance for the payment of fees, expenses and prices and a list of the euro accounts of the European Patent Organisation are published in each issue of the Official Journal of the EPO. The guidance includes inter alia a reference to the latest version of the Schedule of fees and expenses where the amounts of fees are set out.

   The Schedule of fees and expenses, published as a Supplement to the Official Journal of the EPO, is also available on the EPO website (**www.epo.org**) and can be found under **www.epo.org/schedule-of-fees**, which allows the viewing, downloading and searching for individual fee amounts, both current and previous.

   Applicants should always check the fee amounts applying at the time of payment.

Payments can be validly made by any person. Permissible methods of payment are laid down in Article 5 Rules relating to Fees. Please note that payment cannot be made by cheque sent to the EPO.

For information on the calculation of the additional fee for applications comprising more than 35 pages, see Notice from the European Patent Office dated 26 January 2009 concerning the 2009 fee structure (OJ EPO 2009, 118), Notice supplementing the notice from the European Patent Office dated 26 January 2009 concerning the 2009 fee structure (OJ EPO 2009, 338) and Guidelines for Examination in the EPO, April 2010, A-III, 13.2.

For an overview of search and examination fees, see Notice from the European Patent Office dated 8 February 2010 (OJ EPO 2010, 133). Fee information is also published on the EPO website under **www.epo.org/fees.**

7. Restoration of priority right

   Where the international application contains a priority claim to an earlier application and it has been filed within two months from the expiration of the 12-month priority period, a request for restoration before the EPO as designated Office (R. 49*ter*.2 PCT) applies under the following circumstances:

   a) No request for restoration filed before the receiving Office (RO) during the international phase (R. 26*bis*.3 PCT)
   b) Negative decision by the RO irrespective of the criterion applied (due care/ unintentionality)
   c) Positive decision by the RO based on the unintentionality criterion.

   For a request to be admissible, it must be filed and the requisite fee must be paid (R. 49*ter*.2(b)(iii) and R. 49*ter*.2(d) PCT) within one month from the applicable time limit under Article 22 PCT for entering the regional phase (R. 49*ter*.2(b)(i) PCT). The request for restoration also needs to state the reasons for the failure to file the international application within the priority period (Rule 49*ter*.2(b)(ii) PCT).

8. If the applicant had appointed a representative during the application's international phase, the present Form will be sent to the representative, asking him to inform the applicant accordingly.
   All subsequent communications will be sent to the applicant, or - if the EPO is informed of his appointment in time - to the applicant's European representative.

9. For more details about time limits and procedural acts before the EPO as designated or elected Office, see the EPO brochure "How to get a European patent", Guide for applicants - Part 2, PCT procedure before the EPO - "Euro-PCT".
   This brochure, the list of professional representatives before the EPO as well as Form 1200 are available on the Internet under **www.epo.org**.

Receiving Section



Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/JP2010/006067

International filing date: 13 October 2010 (13.10.2010)

Document type: Certified copy of priority document

Document details: Country/Office: JP
Number: 2009-253581
Filing date: 05 November 2009 (05.11.2009)

Date of receipt at the International Bureau: 17 November 2010 (17.11.2010)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a),(b) or (b-*bis*)

World Intellectual Property Organization (WIPO) - Geneva, Switzerland
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse

Peloton - EX1005, Page 385
IPR2023-01239 (Peloton v. NEC)

日 本 国 特 許 庁
JAPAN PATENT OFFICE

別紙添付の書類に記載されている事項は下記の出願書類に記載されている事項と同一であることを証明する。

This is to certify that the annexed is a true copy of the following application as filed with this Office.

出 願 年 月 日 Date of Application:	２００９年１１月　５日
出 願 番 号 Application Number:	特願２００９－２５３５８１
パリ条約による外国への出願に用いる優先権の主張の基礎となる出願の国コードと出願番号 The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is	ＪＰ２００９－２５３５８１
出 願 人 Applicant(s):	日本電気株式会社

２０１０年１１月　２日

特許庁長官
Commissioner,
Japan Patent Office　岩井良行

【書類名】　特許願
【整理番号】　32700568
【あて先】　特許庁長官　殿
【国際特許分類】　H04N　7/173
【発明者】
　【住所又は居所】　東京都港区芝五丁目７番１号　日本電気株式会社内
　【氏名】　大西　健夫
【特許出願人】
　【識別番号】　000004237
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【代理人】
　【識別番号】　100124811
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【選任した代理人】
　【識別番号】　100131428
　【弁理士】
　【氏名又は名称】　若山　剛
【手数料の表示】
　【振替番号】　00001122
　【納付金額】　15,000円
【提出物件の目録】
　【物件名】　明細書　1
　【物件名】　特許請求の範囲　1
　【物件名】　要約書　1
　【物件名】　図面　1
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【書類名】明細書
【発明の名称】配信システム
【技術分野】
【０００１】
本発明は、コンテンツを表すコンテンツデータを送信装置から受信装置へ送信する配信システムに関する。
【背景技術】
【０００２】
互いに通信可能に構成された送信装置及び複数の受信装置を含み、複数の受信装置がコンテンツを同期して再生することが可能な配信システムが知られている。この種の配信システムの１つとして特許文献１に記載の配信システムは、複数の受信装置が備える時計の時刻を基準となる時計の時刻に一致させる。更に、送信装置は、受信装置がコンテンツの再生を開始する時刻である再生開始時刻を各受信端末へ送信する。
【０００３】
そして、送信装置は、コンテンツ（例えば、映像又は音声等）を表すコンテンツデータを各受信装置へ送信する。各受信装置は、コンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置（バッファ）に記憶させる。更に、各受信装置は、再生開始時刻になると、記憶されているデータに基づくコンテンツの再生を開始する。この結果、複数の受信装置間で、コンテンツの再生位置を一致させることができる。
【０００４】
また、特許文献２に記載の配信システムは、コンテンツの再生を開始する時刻が複数の受信装置間で異なる場合であっても、複数の受信装置がコンテンツを同期して再生することが可能なシステムである。この配信システムにおいて、第１の受信装置がコンテンツを再生している場合、第２の受信装置は、コンテンツの再生を開始するまでに要する時間を推定し、推定した時間に基づいて再生開始時刻を決定する。そして、第２の受信装置は、決定した再生開始時刻を送信装置へ送信する。
【０００５】
これにより、送信装置は、再生開始時刻以降において第１の受信装置へ送信する予定のコンテンツデータを第２の受信装置へ送信する。そして、第２の受信装置は、再生開始時刻になると、記憶されているデータに基づくコンテンツの再生を開始する。この結果、第１の受信装置及び第２の受信装置の間で、コンテンツの再生位置を一致させることができる。
【先行技術文献】
【特許文献】
【０００６】
【特許文献１】特開２００５－１９１７８６号公報
【特許文献２】特開２００７－１３７０５号公報
【発明の概要】
【発明が解決しようとする課題】
【０００７】
ところで、受信装置がコンテンツデータを受信している期間においても、受信装置が送信装置から単位時間あたりに受信するデータ量（通信速度）は、通信回線の利用状況等に応じて変動する。従って、通信速度が過度に低下した場合には、受信装置の記憶装置に記憶されているコンテンツデータのデータ量が、再生開始時刻までに十分な量に到達しない場合が生じる。このような場合、受信装置は、再生開始時刻にてコンテンツの再生を開始できない虞がある。
【０００８】
これに対処するため、受信装置の記憶装置に記憶されているコンテンツデータに基づいてコンテンツを再生可能な時間である再生可能時間に基づいて、送信されるコンテンツデ

ータの符号化レートを変更するように配信システムを構成することが考えられる。
【０００９】
しかしながら、受信装置がコンテンツデータの受信を開始してから再生開始時刻までの期間において、再生可能時間は、０から徐々に増加していく。従って、再生可能時間のみに基づいて符号化レートを決定すると、受信装置がコンテンツデータの受信を開始した直後においては、符号化レートが過度に小さく設定され、一方、再生開始時刻の直前においては、符号化レートが過度に大きく設定される虞がある。
【００１０】
また、このような問題は、複数の受信装置がコンテンツを同期して再生する配信システムだけでなく、１つの受信装置が設定された再生開始時刻にてコンテンツの再生を開始する配信システムにも同様に生じる。
【００１１】
このため、本発明の目的は、上述した課題である「符号化レートが過度に大きく設定される場合、及び、受信装置が、設定された再生開始時刻にてコンテンツの再生を開始できない場合が生じること」を解決することが可能な配信システムを提供することにある。
【課題を解決するための手段】
【００１２】
かかる目的を達成するため本発明の一形態である配信システムは、互いに通信可能に構成された送信装置及び受信装置を含むシステムである。
更に、上記送信装置は、１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを上記受信装置へ送信するコンテンツ送信手段を備え、
上記受信装置は、上記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて上記コンテンツを再生するコンテンツ再生手段を備え、
上記配信システムは、
現時点から、上記受信装置が上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記受信装置の上記記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて、上記符号化レートを決定する符号化レート決定手段を備え、
上記コンテンツ送信手段は、上記受信装置へ送信するコンテンツデータの上記符号化レートを、上記決定された符号化レートに変更するように構成され、
上記コンテンツ再生手段は、上記設定された再生開始時刻にて、上記コンテンツの再生を開始するように構成される。
【００１３】
また、本発明の他の形態である配信方法は、
互いに通信可能に構成された送信装置及び受信装置を含む配信システムに適用され、
上記送信装置が、１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを上記受信装置へ送信し、
上記受信装置が、上記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて上記コンテンツを再生し、
現時点から、上記受信装置が上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記受信装置の上記記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて、上記符号化レートを決定し、
上記送信装置が上記受信装置へ送信するコンテンツデータの上記符号化レートを、上記決定された符号化レートに変更し、
上記受信装置は、上記設定された再生開始時刻にて、上記コンテンツの再生を開始する方法である。

【００１４】
また、本発明の他の形態である送信装置は、受信装置と通信可能に構成された装置である。
更に、この送信装置は、
１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを上記受信装置へ送信するコンテンツ送信手段を備え、
上記コンテンツ送信手段は、現時点から、上記受信装置が上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記受信装置の記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて決定された符号化レートに、上記受信装置へ送信する上記コンテンツデータの符号化レートを変更するように構成される。
【００１５】
また、本発明の他の形態であるプログラムは、
受信装置と通信可能に構成された送信装置に、
１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを上記受信装置へ送信するコンテンツ送信手段を実現させるとともに、
上記コンテンツ送信手段は、現時点から、上記受信装置が上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記受信装置の記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて決定された符号化レートに、上記受信装置へ送信する上記コンテンツデータの符号化レートを変更するように構成される。
【００１６】
また、本発明の他の形態である受信装置は、送信装置と通信可能に構成された装置である。
更に、この受信装置は、
１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化され且つ上記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて上記コンテンツを再生するコンテンツ再生手段と、
現時点から、上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて、上記符号化レートを決定する符号化レート決定手段と、を備え、
上記コンテンツ再生手段は、上記決定された符号化レートにて符号化されたコンテンツデータを受信するように構成され、且つ、上記設定された再生開始時刻にて、上記コンテンツの再生を開始するように構成される。
【００１７】
また、本発明の他の形態であるプログラムは、
送信装置と通信可能に構成された受信装置に、
１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化され且つ上記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて上記コンテンツを再生するコンテンツ再生手段と、
現時点から、上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて、上記符号化レートを決定する符号化レート決定手段と、を実現させるとともに、
上記コンテンツ再生手段は、上記決定された符号化レートにて符号化されたコンテンツデータを受信するように構成され、且つ、上記設定された再生開始時刻にて、上記コンテ

ンツの再生を開始するように構成される。
【発明の効果】
【００１８】
本発明は、以上のように構成されることにより、符号化レートが無駄に小さくされることを防止しながら、受信装置が設定された再生開始時刻にてコンテンツの再生を確実に開始することができる。
【図面の簡単な説明】
【００１９】
【図１】本発明の第１実施形態に係る配信システムの概略構成を表す図である。
【図２】本発明の第１実施形態に係る配信システムの機能の概略を表すブロック図である。
【図３】本発明の第１実施形態に係る配信システムの作動を示したシーケンス図である。
【図４】本発明の第１実施形態に係るサーバ装置が実行する送信制御プログラムを示したフローチャートである。
【図５】本発明の第１実施形態に係るサーバ装置が記憶するセッション情報を示したテーブルである。
【図６】本発明の第１実施形態に係る端末装置が実行する再生開始制御プログラムを示したフローチャートである。
【図７】本発明の第１実施形態に係るサーバ装置が記憶するセッション情報を示したテーブルである。
【図８】本発明の第１実施形態に係るサーバ装置が記憶するセッション情報を示したテーブルである。
【図９】本発明の第１実施形態に係るサーバ装置が記憶する履歴情報を示したテーブルである。
【図１０】本発明の第１実施形態に係るサーバ装置が実行する符号化レート変更制御プログラムを示したフローチャートである。
【図１１】本発明の第１実施形態に係るサーバ装置が記憶する履歴情報を示したテーブルである。
【図１２】本発明の第１実施形態に係るサーバ装置が記憶する履歴情報を示したテーブルである。
【図１３】本発明の第１実施形態に係る配信システムの作動を示したシーケンス図である。
【図１４】本発明の第１実施形態に係るサーバ装置が記憶するセッション情報を示したテーブルである。
【図１５】本発明の第１実施形態に係るサーバ装置が記憶するセッション情報を示したテーブルである。
【図１６】本発明の第２実施形態に係る配信システムの機能の概略を表すブロック図である。
【発明を実施するための形態】
【００２０】
以下、本発明に係る、配信システム、配信方法、送信装置、プログラム、及び、受信装置、の各実施形態について図１～図１６を参照しながら説明する。
【００２１】
＜第１実施形態＞
図１に示したように、第１実施形態に係る配信システム１は、サーバ装置（送信装置）１０と、複数（本例では、３つ）の端末装置（受信装置）２０ａ，２０ｂ，２０ｃと、を含む。サーバ装置１０、及び、端末装置２０ａ～２０ｃは、通信回線（本例では、インターネット）ＮＷを介して、互いに通信可能に接続されている。
【００２２】

サーバ装置１０は、情報処理装置である。サーバ装置１０は、図示しない中央処理装置（ＣＰＵ；Ｃｅｎｔｒａｌ　Ｐｒｏｃｅｓｓｉｎｇ　Ｕｎｉｔ）、及び、記憶装置（メモリ及びハードディスク駆動装置（ＨＤＤ；Ｈａｒｄ　Ｄｉｓｋ　Ｄｒｉｖｅ））を備える。サーバ装置１０は、記憶装置に記憶されているプログラムをＣＰＵが実行することにより、後述する機能を実現するように構成されている。

【００２３】

本例では、各端末装置２０ａ～２０ｃは、パーソナル・コンピュータである。なお、各端末装置２０ａ～２０ｃは、携帯電話端末、ＰＨＳ（Ｐｅｒｓｏｎａｌ　Ｈａｎｄｙｐｈｏｎｅ　Ｓｙｓｔｅｍ）、ＰＤＡ（Ｐｅｒｓｏｎａｌ　Ｄａｔａ　Ａｓｓｉｓｔａｎｃｅ、Ｐｅｒｓｏｎａｌ　Ｄｉｇｉｔａｌ　Ａｓｓｉｓｔａｎｔ）、カーナビゲーション端末、又は、ゲーム端末等であってもよい。

【００２４】

各端末装置２０ａ～２０ｃは、ＣＰＵ、記憶装置、入力装置及び出力装置を備える。出力装置は、ディスプレイを有する。出力装置は、ＣＰＵから出力された画像情報に基づいて、文字及び図形等からなる画像をディスプレイに表示させる。入力装置は、キーボード及びマウスを有する。各端末装置２０ａ～２０ｃは、キーボード及びマウスを介して、ユーザの操作に基づく情報が入力されるように構成されている。

【００２５】

各端末装置２０ａ～２０ｃは、記憶装置に記憶されているプログラムをＣＰＵが実行することにより、後述する機能を実現するように構成されている。

【００２６】

図２は、上記のように構成された配信システム１の機能を表すブロック図である。ここでは、端末装置２０ａ～２０ｃのうちの端末装置２０ａの機能について説明する。なお、端末装置２０ｂ及び端末装置２０ｃも、端末装置２０ａと同様の機能を有する。

【００２７】

また、配信システム１の機能は、端末装置２０ａのＣＰＵが後述する図６に示したフローチャートにより表されるプログラム等を実行するとともに、サーバ装置１０のＣＰＵが後述する図４及び図１０に示したフローチャートにより表されるプログラム等を実行することにより、実現される。

【００２８】

端末装置２０ａの機能は、要求送信部３１と、同期再生制御部（同期再生制御手段）３２と、コンテンツ再生部（コンテンツ再生手段）３３と、再生可能時間送信部３４と、を含む。

【００２９】

また、サーバ装置１０の機能は、要求受信部４１と、セッション情報記憶部４２と、再生開始時刻設定部（再生開始時刻設定手段）４３と、コンテンツデータ記憶部４４と、コンテンツ送信部（コンテンツ送信手段）４５と、再生可能時間受信部４６と、符号化レート決定部（符号化レート決定手段）４７と、を含む。

【００３０】

端末装置２０ａの要求送信部３１は、ユーザにより入力装置を介して入力されたセッション開始指示を受け付ける。セッション開始指示は、セッションを開始する旨を指示する情報である。セッション開始指示は、コンテンツを識別するためのコンテンツ識別情報（コンテンツＩＤ）と、コンテンツを同期させて再生する他の端末装置を識別するための端末識別情報（端末ＩＤ）である他端末ＩＤと、を含む。

【００３１】

要求送信部３１は、セッション開始指示を受け付けた場合、セッション開始指示に含まれるコンテンツＩＤと、自装置（端末装置２０ａ）を識別するための端末識別情報（端末ＩＤ）である自端末ＩＤ及びセッション開始指示に含まれる他端末ＩＤからなる端末ＩＤと、を含むセッション開始要求をサーバ装置１０へ送信する。セッション開始要求は、セッションを開始する旨を要求する情報である。

【００３２】
サーバ装置１０の要求受信部４１は、端末装置２０ａからセッション開始要求を受信する。要求受信部４１は、セッション開始要求を受信した場合、セッションを識別するためのセッション識別情報（セッションＩＤ）を生成する。更に、要求受信部４１は、生成したセッションＩＤと、セッション開始要求に含まれる、コンテンツＩＤ及び端末ＩＤと、を含むセッション情報をセッション情報記憶部４２に記憶させる。
【００３３】
加えて、要求受信部４１は、生成したセッションＩＤを、セッション開始要求に含まれる端末ＩＤにより識別される端末装置２０ａ～２０ｃのそれぞれへ送信する。
【００３４】
端末装置２０ａの要求送信部３１は、サーバ装置１０からセッションＩＤを受信する。更に、要求送信部３１は、ユーザにより入力装置を介して入力されたセッション参加指示を受け付ける。セッション参加指示は、セッションへ参加する旨を指示する情報である。
【００３５】
要求送信部３１は、セッション参加指示を受け付けた場合、受信したセッションＩＤと、自装置（端末装置２０ａ）を識別するための端末識別情報（端末ＩＤ）である自端末ＩＤと、起動時間と、通信速度と、を含むセッション参加要求をサーバ装置１０へ送信する。セッション参加要求は、セッションへ参加する旨を要求する情報である。
【００３６】
起動時間は、端末装置２０ａがコンテンツを再生するために実行するアプリケーションプログラムが起動するために要する時間である。また、通信速度は、サーバ装置１０から端末装置２０ａへ単位時間あたりに送信されるデータのデータ量である。本例では、起動時間及び通信速度は、ユーザにより入力された値である。なお、端末装置２０ａは、起動時間及び通信速度を計測し、計測された起動時間及び通信速度を含むセッション参加要求を送信するように構成されていてもよい。
【００３７】
サーバ装置１０の要求受信部４１は、各端末装置２０ａ～２０ｃからセッション参加要求を受信する。要求受信部４１は、セッション参加要求を受信した場合、セッション情報記憶部４２に記憶されているセッション情報のうちの、セッション参加要求に含まれるセッションＩＤ及び端末ＩＤを含むセッション情報に、セッション参加要求に含まれる起動時間及び通信速度を追加する。
【００３８】
サーバ装置１０のコンテンツデータ記憶部４４は、複数のコンテンツデータを予め記憶（蓄積）している。各コンテンツデータは、複数のコンテンツ（例えば、映像及び／又は音声等を表す情報）の１つを表すデータである。コンテンツデータ記憶部４４は、各コンテンツを表すコンテンツデータとして、複数の異なる符号化レートのそれぞれにて当該コンテンツが符号化された複数のコンテンツデータを記憶している。符号化レートは、コンテンツを単位時間（例えば、１秒）だけ等速再生（１倍速にて再生）するためのコンテンツデータのデータ量（データサイズ、例えば、バイト数）を表す。
【００３９】
サーバ装置１０の再生開始時刻設定部４３は、再生開始時刻決定部４３ａと、再生開始時刻送信部４３ｂと、を含む。
【００４０】
再生開始時刻決定部４３ａは、セッション開始要求が受信されてから、予め設定された待機時間が経過するまでの間に受信されたセッション参加要求に基づいて、再生開始時刻を決定する。再生開始時刻は、セッション参加要求を送信してきた端末装置がコンテンツの再生を開始する時刻である。
【００４１】
具体的には、再生開始時刻決定部４３ａは、セッション開始要求が受信されてから上記待機時間が経過した時点にて、セッション情報記憶部４２に記憶されているセッション情

報のうちの、当該セッション開始要求に対して生成したセッションＩＤを含むセッション情報を取得する。

【００４２】

再生開始時刻決定部４３ａは、取得されたセッション情報のそれぞれ（即ち、端末装置のそれぞれ）に対して、装置毎再生準備時間T_pを算出する。装置毎再生準備時間T_pは、端末装置がコンテンツの再生を開始するために要する時間である。

【００４３】

本例では、再生開始時刻決定部４３ａは、コンテンツデータ記憶部４４に記憶されているコンテンツデータのうちの、取得されたセッション情報に含まれるコンテンツＩＤにより識別されるコンテンツを表すコンテンツデータを抽出する。そして、再生開始時刻決定部４３ａは、抽出されたコンテンツデータが有する符号化レートのうちの、取得されたセッション情報に含まれる通信速度以下であり且つ当該通信速度に最も近い値を有する符号化レートｒを特定する。

【００４４】

そして、再生開始時刻決定部４３ａは、特定した符号化レートｒと、取得されたセッション情報に含まれる通信速度Ｂと、予め設定された目標再生可能時間T_dと、下記式（１）と、に基づいて、再生準備通信時間T_cを算出する。

$$T_c = r \cdot T_d / B \quad \cdots (1)$$

【００４５】

目標再生可能時間T_dは、再生可能時間の目標値である。なお、目標再生可能時間は、端末装置毎に設定されていてもよい。また、目標再生可能時間は、端末装置から受信された値であってもよい。再生可能時間は、端末装置の記憶装置（後述するバッファ部３３ｂ）に記憶されているコンテンツデータに基づいて端末装置がコンテンツを再生可能な時間である。再生準備通信時間T_cは、端末装置がコンテンツデータの受信を開始してから、再生可能時間が目標再生可能時間T_dに一致するまでに要する時間である。

【００４６】

更に、再生開始時刻決定部４３ａは、取得されたセッション情報に含まれる起動時間T_aと、上記算出した再生準備通信時間T_cと、を加えることにより、下記式（２）のように、装置毎再生準備時間T_pを算出する。

$$T_p = T_a + T_c \quad \cdots (2)$$

【００４７】

加えて、再生開始時刻決定部４３ａは、算出された装置毎再生準備時間T_pの最大値T_{pmax}を現時点の時刻ｔに加えることにより、下記式（３）のように、再生開始時刻T_sを決定する。

$$T_s = t + T_{pmax} \quad \cdots (3)$$

【００４８】

また、再生開始時刻決定部４３ａは、セッション開始要求が受信されてから、上記待機時間が経過した後にセッション参加要求を受信した場合、上述した場合と同様に、そのセッション参加要求を送信してきた端末装置に対する再生開始時刻T_sを決定する。

【００４９】

再生開始時刻決定部４３ａは、再生開始時刻を決定した場合、再生開始時刻を決定する基となったセッション参加要求に含まれるセッションＩＤ及び端末ＩＤを含むセッション情報に、決定した再生開始時刻を追加する。

【００５０】

再生開始時刻送信部４３ｂは、再生開始時刻決定部４３ａにより決定された再生開始時刻を、セッション参加要求を送信してきた端末装置のそれぞれへ送信する。

このように、再生開始時刻設定部４３は、目標再生可能時間と、起動時間と、通信速度と、に基づいて再生開始時刻を設定する。

【００５１】

端末装置２０ａの同期再生制御部３２は、再生開始時刻受信部３２ａを含む。再生開始

時刻受信部３２ａは、サーバ装置１０から送信された再生開始時刻を受信する。同期再生制御部３２は、再生開始時刻受信部３２ａにより受信された再生開始時刻を記憶装置に記憶させる。同期再生制御部３２は、予め設定された制御周期が経過する毎に、現時点の時刻が記憶されている再生開始時刻に到達した（現時点が再生開始時刻となった）か否かを判定する。

【００５２】

同期再生制御部３２は、現時点の時刻が記憶されている再生開始時刻に到達した場合、再生開始指示をコンテンツ再生部３３へ出力する。再生開始指示は、コンテンツの再生を開始する旨を指示する情報である。このようにして、同期再生制御部３２は、複数の端末装置２０ａ～２０ｃのそれぞれが再生するコンテンツの再生位置を複数の端末装置２０ａ～２０ｃ間で一致させる。

【００５３】

サーバ装置１０のコンテンツ送信部４５は、コンテンツデータ記憶部４４に記憶されているコンテンツデータを端末装置２０ａ～２０ｃへ送信する。即ち、コンテンツ送信部４５は、１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを端末装置２０ａ～２０ｃへ送信する。

【００５４】

具体的には、コンテンツ送信部４５は、再生開始時刻設定部４３により再生開始時刻が決定された場合、再生開始時刻を決定する基となったセッション参加要求を送信してきた端末装置へ、コンテンツデータ記憶部４４に記憶されているコンテンツデータを送信する。

【００５５】

このとき、コンテンツ送信部４５は、セッション参加要求に含まれるセッションＩＤを含むセッション情報に含まれるコンテンツＩＤにより識別されるコンテンツデータであって、当該セッション参加要求を送信してきた端末装置に対して再生開始時刻決定部４３ａにより特定された符号化レートにて符号化されたコンテンツデータを送信する。

【００５６】

コンテンツ送信部４５は、セッション開始要求が受信されてから、上記待機時間が経過するまでの間に受信されたセッション参加要求に基づいてコンテンツデータを送信する場合、先頭位置からコンテンツデータの送信を開始する。

【００５７】

一方、コンテンツ送信部４５は、セッション開始要求が受信されてから、上記待機時間が経過した後に受信されたセッション参加要求に基づいてコンテンツデータを送信する場合、判定条件が成立しているか否かを判定する。ここで、判定条件は、上記セッション参加要求に基づいて再生開始時刻設定部４３により決定された再生開始時刻（第２の再生開始時刻）が、当該セッション参加要求と同一のセッションＩＤを含む他のセッション参加要求に基づいて再生開始時刻設定部４３により決定された再生開始時刻（第１の再生開始時刻）よりも後の時刻であるという条件である。

【００５８】

コンテンツ送信部４５は、第２の再生開始時刻が第１の再生開始時刻以前の時刻である場合、先頭位置からコンテンツデータの送信を開始する。

【００５９】

一方、コンテンツ送信部４５は、第２の再生開始時刻が第１の再生開始時刻よりも後の時刻である場合、先頭位置から、第１の再生開始時刻と第２の再生開始時刻との差だけ後の位置を送信開始位置として決定する。送信開始位置は、コンテンツデータ内の位置であって、当該コンテンツデータの送信を開始する位置である。そして、コンテンツ送信部４５は、決定した送信開始位置からコンテンツデータの送信を開始する。

【００６０】

即ち、コンテンツ送信部４５は、第１の端末装置に対して設定された再生開始時刻（第１の再生開始時刻）よりも、第２の端末装置に対して設定された再生開始時刻（第２の再

生開始時刻）が後の時刻である場合、当該第２の再生開始時刻にて当該第１の端末装置が再生しているコンテンツの再生位置（即ち、送信開始位置）を推定する。そして、コンテンツ送信部４５は、コンテンツデータのうちの、当該推定された再生位置以降の部分を当該第２の端末装置へ送信する。

【００６１】

端末装置２０ａのコンテンツ再生部３３は、コンテンツ受信部３３ａと、バッファ部３３ｂと、コンテンツ再生実行部３３ｃと、を含む。

コンテンツ受信部３３ａは、サーバ装置１０により送信されたコンテンツデータを受信する。バッファ部３３ｂは、コンテンツ受信部３３ａにより受信されたデータを記憶する。コンテンツ再生実行部３３ｃは、バッファ部３３ｂに記憶されているデータに基づいてコンテンツを再生する。

【００６２】

即ち、コンテンツ再生部３３は、サーバ装置１０により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいてコンテンツを再生する（ストリーミング方式により再生を行う）。

【００６３】

なお、コンテンツ再生実行部３３ｃは、同期再生制御部３２により出力された再生開始指示を受け付けた場合に（即ち、設定された再生開始時刻にて）、コンテンツの再生を開始する。

【００６４】

端末装置２０ａの再生可能時間送信部３４は、バッファ部３３ｂに記憶されているコンテンツデータに基づいてコンテンツ再生実行部３３ｃがコンテンツを再生可能な時間である再生可能時間を、予め設定された取得周期（変更周期）が経過する毎に、取得する。再生可能時間送信部３４は、再生可能時間が取得された場合、取得された再生可能時間と、自端末ＩＤ（端末ＩＤ）と、セッションＩＤと、を含む再生可能時間情報をサーバ装置１０へ送信する。

【００６５】

サーバ装置１０の再生可能時間受信部４６は、各端末装置２０ａ～２０ｃから再生可能時間情報を受信する。

サーバ装置１０の符号化レート決定部４７は、再生可能時間受信部４６により再生可能時間情報が受信された場合、再生可能時間情報に含まれる端末ＩＤ及びセッションＩＤを含むセッション情報に含まれる再生開始時刻を取得する。

【００６６】

符号化レート決定部４７は、現時点から、取得（即ち、設定）された再生開始時刻までの残余時間と、再生可能時間情報に含まれる再生可能時間と、に基づいて、当該再生可能時間情報を送信してきた端末装置に対して符号化レートを決定する。

【００６７】

具体的には、符号化レート決定部４７は、再生可能時間が目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を符号化レートとして決定する。

【００６８】

本例では、符号化レート決定部４７は、下記式（４）に基づいて、現時点から上記変更周期だけ前（過去）の時点までの期間における通信速度B_nを算出（取得）する。ここで、ｎは整数であり、当該端末装置から再生可能時間情報を受信した回数を表す。

$$B_n=(T_n-T_{n-1})\cdot r_n/(t_n-t_{n-1}) \quad \cdots(4)$$

【００６９】

ここで、t_nは、今回、再生可能時間情報を受信した（即ち、現時点の）時刻であり、t_{n-1}は、前回、再生可能時間情報を受信した（即ち、変更周期だけ前の時点の）時刻である。また、T_nは、今回受信した（即ち、現時点の）再生可能時間であり、T_{n-1}

は、前回受信した（即ち、変更周期だけ前の時点の）再生可能時間である。また、r_nは、時刻t_{n-1}から時刻t_nまでの間に送信されたコンテンツデータが有する符号化レートである。

【００７０】

本例では、現時点から再生開始時刻までの間、通信速度が上記通信速度B_nに維持されることを仮定して、次回、再生可能時間情報を受信する（即ち、変更周期だけ後の時点の）時刻までの間に送信されるコンテンツデータが有する符号化レートr_{n+1}を決定する。即ち、符号化レート決定部４７は、下記式（５）に基づいて、符号化レートr_{n+1}を決定する。

$$r_{n+1}=B_n\cdot(t_s-t_n)/(T_d-T_n) \quad \cdots(5)$$

【００７１】

即ち、符号化レート決定部４７は、取得された通信速度B_nに残余時間t_s-t_nを乗じた値を、目標再生可能時間T_dから再生可能時間T_nを減じた値T_d-T_nにより除した値を符号化レートr_{n+1}として決定する。

【００７２】

コンテンツ送信部４５は、符号化レート決定部４７により符号化レートr_{n+1}が決定された場合、その符号化レートr_{n+1}を決定する基となった再生可能時間情報を送信してきた端末装置へ送信するコンテンツデータを、当該符号化レートr_{n+1}により符号化されたコンテンツデータに変更する。即ち、コンテンツ送信部４５は、再生可能時間情報を送信してきた端末装置へ送信するコンテンツデータの符号化レートを、再生可能時間情報に基づいて決定された符号化レートに変更する。

【００７３】

なお、コンテンツ送信部４５は、符号化レート決定部４７により決定された符号化レートr_{n+1}を有するコンテンツデータがコンテンツデータ記憶部４４に記憶されていない場合、コンテンツデータ記憶部４４に記憶されているコンテンツデータのうちの、当該符号化レートr_{n+1}以下であり且つ当該符号化レートr_{n+1}に最も近い符号化レートを有するコンテンツデータを送信する。

【００７４】

次に、上述した配信システム１の作動について説明する。なお、本例では、サーバ装置１０は、各コンテンツに対して、２Ｍｂｐｓ、４Ｍｂｐｓ、１６Ｍｂｐｓ、及び、５０Ｍｂｐｓのそれぞれにて符号化されたコンテンツデータを記憶装置に予め記憶させている。また、目標再生可能時間T_dは、３０秒に設定されている。

【００７５】

図３に示したように、端末装置２０ａは、コンテンツＩＤとしての「Ｃ０１」と、他端末ＩＤとしての「Ｒ０２」及び「Ｒ０３」と、を含むセッション開始指示を受け付ける。本例では、「Ｒ０１」は、端末装置２０ａを識別するための端末ＩＤであり、「Ｒ０２」は、端末装置２０ｂを識別するための端末ＩＤであり、「Ｒ０３」は、端末装置２０ｃを識別するための端末ＩＤである。

【００７６】

端末装置２０ａは、セッション開始指示を受け付けると、コンテンツＩＤとしての「Ｃ０１」と、端末ＩＤとしての「Ｒ０１」、「Ｒ０２」及び「Ｒ０３」と、を含むセッション開始要求をサーバ装置１０へ送信する（ステップＳ１０１）。

【００７７】

サーバ装置１０は、端末装置２０ａからセッション開始要求を受信すると、図４にフローチャートにより示した送信制御プログラムを実行する。サーバ装置１０は、セッションを識別するためのセッションＩＤとして「Ｓ０１」を生成する。更に、サーバ装置１０は、生成したセッションＩＤ「Ｓ０１」と、セッション開始要求に含まれる、コンテンツＩＤ「Ｃ０１」及び端末ＩＤ（「Ｒ０１」、「Ｒ０２」及び「Ｒ０３」）のそれぞれと、を含むセッション情報を、図５に示したように、記憶装置に記憶させる。

【００７８】

加えて、サーバ装置１０は、生成したセッションＩＤを、セッション開始要求に含まれる端末ＩＤにより識別される端末装置２０ａ～２０ｃのそれぞれへ送信する（図４のステップＳ２０１、図３のステップＳ１０２）。その後、サーバ装置１０は、上記待機時間（本例では、３秒）だけ待機する（図４のステップＳ２０２）。

【００７９】

次いで、端末装置２０ａのユーザがセッション参加指示を入力すると、端末装置２０ａは、図６にフローチャートにより示した再生開始制御プログラムを実行する。端末装置２０ａは、受信したセッションＩＤ「Ｓ０１」と、端末ＩＤ「Ｒ０１」と、起動時間「１２００」（ｍｓ）と、通信速度「３」（Ｍｂｐｓ）と、を含むセッション参加要求をサーバ装置１０へ送信する（図６のステップＳ３０１、図３のステップＳ１０３）。

【００８０】

本例では、端末装置２０ｂも、端末装置２０ａと同様に、セッションＩＤ「Ｓ０１」と、端末ＩＤ「Ｒ０２」と、起動時間「１０００」（ｍｓ）と、通信速度「５０」（Ｍｂｐｓ）と、を含むセッション参加要求をサーバ装置１０へ送信する（図３のステップＳ１０４）。

【００８１】

サーバ装置１０は、各端末装置２０ａ，２０ｂからセッション参加要求を受信すると、図７に示したように、記憶装置に記憶されているセッション情報のうちの、セッション参加要求に含まれるセッションＩＤ及び端末ＩＤを含むセッション情報に、セッション参加要求に含まれる起動時間及び通信速度を追加する。

【００８２】

そして、待機時間が経過すると、サーバ装置１０は、セッション参加要求を送信してきた端末装置２０ａ，２０ｂのそれぞれに対して、記憶装置に記憶されているコンテンツデータが有する符号化レートのうちの、通信速度以下であり且つ通信速度に最も近い符号化レートｒを特定する。本例では、サーバ装置１０は、端末装置２０ａに対する符号化レートｒとして「2Ｍｂｐｓ」を特定し、端末装置２０ｂに対する符号化レートｒとして「５０Ｍｂｐｓ」を特定する。

【００８３】

次いで、サーバ装置１０は、セッション参加要求を送信してきた端末装置２０ａ，２０ｂのそれぞれに対して、記憶されているセッション情報に含まれる通信速度Ｂ及び起動時間T_aと、予め設定された目標再生可能時間T_dと、に基づいて装置毎再生準備時間T_pを算出する（図４のステップ２０３）。

【００８４】

本例では、サーバ装置１０は、上記式（１）～（３）に基づいて、端末装置２０ａに対する装置毎再生準備時間T_pとして「２１．２」を算出し、端末装置２０ｂに対する装置毎再生準備時間T_pとして「３１」を算出する。

【００８５】

次いで、サーバ装置１０は、算出した装置毎再生準備時間T_pの最大値T_{pmax}（ここでは、「３１」）に基づいて再生開始時刻T_s（「１３：０１：３４」）を決定する（図４のステップＳ２０４）。そして、サーバ装置１０は、図８に示したように、セッションＩＤ「Ｓ０１」及び端末ＩＤ「Ｒ０１」を含むセッション情報、並びに、セッションＩＤ「Ｓ０１」及び端末ＩＤ「Ｒ０２」を含むセッション情報、のそれぞれに、決定した再生開始時刻を追加する。

【００８６】

次いで、サーバ装置１０は、セッション参加要求を送信してきた端末装置２０ａ，２０ｂのそれぞれへ、決定した再生開始時刻T_sを送信する（図４のステップＳ２０５、図３のステップＳ１０５）。

【００８７】

これにより、端末装置２０ａは、サーバ装置１０から再生開始時刻T_sを受信する（図６のステップＳ３０２）。なお、端末装置２０ｂも、以降において、端末装置２０ａと同

様に作動する。
【００８８】
そして、サーバ装置１０は、決定した再生開始時刻Ｔｓが、受信したセッション参加要求と同一のセッションＩＤを含む他のセッション参加要求に基づいて決定された再生開始時刻よりも後の時刻であるか否かを判定する（図４のステップＳ２０６）。
【００８９】
この時点では、サーバ装置１０は、受信したセッション参加要求と同一のセッションＩＤを含む他のセッション参加要求を受信していない。従って、サーバ装置１０は、「Ｎｏ」と判定してステップＳ２０８へ進み、セッション参加要求を送信してきた端末装置２０ａ，２０ｂのそれぞれへのコンテンツデータの送信を、当該コンテンツデータの先頭位置から開始する（図４のステップＳ２０８、図３のステップＳ１０６）。
【００９０】
このとき、サーバ装置１０が端末装置２０ａへ送信するコンテンツデータは、セッションＩＤ「Ｓ０１」を含むセッション情報に含まれるコンテンツＩＤ「Ｃ０１」により識別されるコンテンツを表すコンテンツデータである。更に、このコンテンツデータは、端末装置２０ａから受信したセッション参加要求に含まれる通信速度に基づいて特定された符号化レートにて符号化されたデータである。
【００９１】
同様に、サーバ装置１０が端末装置２０ｂへ送信するコンテンツデータは、セッションＩＤ「Ｓ０１」を含むセッション情報に含まれるコンテンツＩＤ「Ｃ０１」により識別されるコンテンツを表すコンテンツデータである。更に、このコンテンツデータは、端末装置２０ｂから受信したセッション参加要求に含まれる通信速度に基づいて特定された符号化レートにて符号化されたデータである。
【００９２】
また、サーバ装置１０は、図９に示したように、セッション参加要求に含まれるセッションＩＤ及び端末ＩＤと、再生可能時間の初期値としての「０」と、再生開始時刻と現時点の時刻との差「３１」と、を対応付けた履歴情報を記憶装置に記憶させる。
【００９３】
一方、端末装置２０ａは、サーバ装置１０により送信されたコンテンツデータの受信を開始する（図６のステップＳ３０３）。次いで、端末装置２０ａは、現時点の時刻が再生開始時刻Ｔｓに到達したか否かを判定する（図６のステップＳ３０４）。この時点では、現時点の時刻は、再生開始時刻Ｔｓに到達していない。
【００９４】
従って、端末装置２０ａは、「Ｎｏ」と判定してステップＳ３０５へ進み、コンテンツデータの受信が開始してから送信周期（本例では、５秒）が経過したか否かを判定する（図６のステップＳ３０５）。この時点では、コンテンツデータの受信が開始してから送信周期は経過していない。
【００９５】
従って、端末装置２０ａは、「Ｎｏ」と判定してステップＳ３０４へ戻り、コンテンツデータの受信が開始してから送信周期が経過するまで、上記処理を繰り返し実行する。
【００９６】
そして、コンテンツデータの受信が開始してから送信周期が経過すると、端末装置２０ａは、ステップＳ３０５にて「Ｙｅｓ」と判定してステップＳ３０６へ進み、再生可能時間を取得する。いま、取得された再生可能時間が「７」秒である場合を想定する。
【００９７】
そして、端末装置２０ａは、取得した再生可能時間「７」と、端末ＩＤ「Ｒ０１」と、セッションＩＤ「Ｓ０１」と、を含む再生可能時間情報をサーバ装置１０へ送信する（図３のステップＳ１０７）。同様に、端末装置２０ｂは、再生可能時間「２」と、端末ＩＤ「Ｒ０２」と、セッションＩＤ「Ｓ０１」と、を含む再生可能時間情報をサーバ装置１０へ送信する（図３のステップＳ１０８）。

【００９８】
一方、サーバ装置１０は、図４のステップＳ２０９へ進み、各端末装置に対する符号化レート変更制御を行うため、図１０にフローチャートにより示した符号化レート変更制御プログラムを、コンテンツデータを送信している各端末装置２０ａ，２０ｂに対して独立に実行する。
【００９９】
先ず、サーバ装置１０が端末装置２０ａに対して実行する符号化レート変更制御について説明する。
【０１００】
サーバ装置１０は、現時点の時刻が再生開始時刻T_sに到達したか否かを判定する（図１０のステップＳ４０１）。この時点では、現時点の時刻は、再生開始時刻T_sに到達していない。
【０１０１】
従って、サーバ装置１０は、「Ｎｏ」と判定してステップＳ４０２へ進み、端末装置２０ａから再生可能時間情報を受信したか否かを判定する。サーバ装置１０は、端末装置２０ａから再生可能時間情報を受信していない場合、ステップＳ４０１へ戻り、上記処理を繰り返し実行する。
【０１０２】
いま、サーバ装置１０は、端末装置２０ａから再生可能時間情報を受信している。従って、サーバ装置１０は、「Ｙｅｓ」と判定してステップＳ４０３へ進み、図１１に示したように、再生可能時間情報に含まれるセッションＩＤ「Ｓ０１」、端末ＩＤ「Ｒ０１」及び再生可能時間「7」と、再生開始時刻と現時点の時刻との差「２６」と、を対応付けた履歴情報を記憶装置に記憶させる。
【０１０３】
サーバ装置１０は、記憶装置に記憶されている履歴情報に基づいて符号化レートを決定する。本例では、サーバ装置１０は、上記式（４）に基づいて、通信速度B_nとして「２．８Ｍｂｐｓ」を算出する。更に、サーバ装置１０は、上記式（５）に基づいて、符号化レートr_{n+1}として「３．１６５Ｍｂｐｓ」を算出（決定）する（図１０のステップＳ４０３）。
【０１０４】
そして、サーバ装置１０は、記憶装置に記憶されているコンテンツデータの符号化レートのうちの、当該符号化レートr_{n+1}以下であり且つ当該符号化レートr_{n+1}に最も近い符号化レートとして「２Ｍｂｐｓ」を特定する。次いで、サーバ装置１０は、端末装置２０ａへ送信しているコンテンツデータの符号化レートを、上記特定された符号化レート「２Ｍｂｐｓ」に変更する（図１０のステップＳ４０４）。その後、サーバ装置１０は、ステップＳ４０１へ戻り、上述した処理を繰り返し実行する。
【０１０５】
次に、サーバ装置１０が端末装置２０ｂに対して実行する符号化レート変更制御について説明する。
【０１０６】
サーバ装置１０は、端末装置２０ｂから再生可能時間情報を受信すると、図１０のステップＳ４０３へ進み、図１１に示したように、再生可能時間情報に含まれるセッションＩＤ「Ｓ０１」、端末ＩＤ「Ｒ０２」及び再生可能時間「２」と、再生開始時刻と現時点の時刻との差「２６」と、を対応付けた履歴情報を記憶装置に記憶させる。
【０１０７】
サーバ装置１０は、記憶装置に記憶されている履歴情報に基づいて符号化レートを決定する。本例では、サーバ装置１０は、上記式（４）に基づいて、通信速度B_nとして「２０Ｍｂｐｓ」を算出する。更に、サーバ装置１０は、上記式（５）に基づいて、符号化レートr_{n+1}として「１８．５７Ｍｂｐｓ」を算出（決定）する（図１０のステップＳ４０３）。

【０１０８】
そして、サーバ装置１０は、記憶装置に記憶されているコンテンツデータの符号化レートのうちの、当該符号化レートr_{n+1}以下であり且つ当該符号化レートr_{n+1}に最も近い符号化レートとして「１６Ｍｂｐｓ」を特定する。次いで、サーバ装置１０は、端末装置２０ｂへ送信しているコンテンツデータの符号化レートを、上記特定された符号化レート「１６Ｍｂｐｓ」に変更する（図１０のステップＳ４０４）。その後、サーバ装置１０は、ステップＳ４０１へ戻り、上述した処理を繰り返し実行する。
【０１０９】
そして、端末装置２０ａ及び端末装置２０ｂが再生可能時間情報を送信してから再び送信周期が経過すると、端末装置２０ａ及び端末装置２０ｂのそれぞれは、再び、図６のステップＳ３０５にて「Ｙｅｓ」と判定してステップＳ３０６へ進み、再生可能時間情報をサーバ装置１０へ送信する。
【０１１０】
いま、端末装置２０ａが、再生可能時間「１８」と、端末ＩＤ「Ｒ０１」と、セッションＩＤ「Ｓ０１」と、を含む再生可能時間情報をサーバ装置１０へ送信する場合であって、端末装置２０ｂが、再生可能時間「１４」と、端末ＩＤ「Ｒ０２」と、セッションＩＤ「Ｓ０１」と、を含む再生可能時間情報をサーバ装置１０へ送信する場合を想定する。
【０１１１】
先ず、サーバ装置１０が端末装置２０ａに対して実行する符号化レート変更制御について説明する。
【０１１２】
サーバ装置１０は、図１０のステップＳ４０２にて「Ｙｅｓ」と判定してステップＳ４０３へ進み、図１２に示したように、再生可能時間情報に含まれるセッションＩＤ「Ｓ０１」、端末ＩＤ「Ｒ０１」及び再生可能時間「１８」と、再生開始時刻と現時点の時刻との差「２１」と、を対応付けた履歴情報を記憶装置に記憶させる。
【０１１３】
サーバ装置１０は、記憶装置に記憶されている履歴情報に基づいて符号化レートを決定する。本例では、サーバ装置１０は、上記式（４）に基づいて、通信速度B_nとして「４．４Ｍｂｐｓ」を算出する。更に、サーバ装置１０は、上記式（５）に基づいて、符号化レートr_{n+1}として「７．７Ｍｂｐｓ」を算出（決定）する（図１０のステップＳ４０３）。
【０１１４】
そして、サーバ装置１０は、記憶装置に記憶されているコンテンツデータの符号化レートのうちの、当該符号化レートr_{n+1}以下であり且つ当該符号化レートr_{n+1}に最も近い符号化レートとして「４Ｍｂｐｓ」を特定する。次いで、サーバ装置１０は、端末装置２０ａへ送信しているコンテンツデータの符号化レートを、上記特定された符号化レート「４Ｍｂｐｓ」に変更する（図１０のステップＳ４０４）。その後、サーバ装置１０は、ステップＳ４０１へ戻り、上述した処理を繰り返し実行する。
【０１１５】
次に、サーバ装置１０が端末装置２０ｂに対して実行する符号化レート変更制御について説明する。
【０１１６】
サーバ装置１０は、図１０のステップＳ４０２にて「Ｙｅｓ」と判定してステップＳ４０３へ進み、図１２に示したように、再生可能時間情報に含まれるセッションＩＤ「Ｓ０１」、端末ＩＤ「Ｒ０２」及び再生可能時間「１４」と、再生開始時刻と現時点の時刻との差「２１」と、を対応付けた履歴情報を記憶装置に記憶させる。
【０１１７】
サーバ装置１０は、記憶装置に記憶されている履歴情報に基づいて符号化レートを決定する。本例では、サーバ装置１０は、上記式（４）に基づいて、通信速度B_nとして「３８．４Ｍｂｐｓ」を算出する。更に、サーバ装置１０は、上記式（５）に基づいて、符号

化レートr_{n+1}として「５０．４Ｍｂｐｓ」を算出（決定）する（図１０のステップＳ４０３）。

【０１１８】

そして、サーバ装置１０は、記憶装置に記憶されているコンテンツデータの符号化レートのうちの、当該符号化レートr_{n+1}以下であり且つ当該符号化レートr_{n+1}に最も近い符号化レートとして「５０Ｍｂｐｓ」を特定する。次いで、サーバ装置１０は、端末装置２０ｂへ送信しているコンテンツデータの符号化レートを、上記特定された符号化レート「５０Ｍｂｐｓ」に変更する（図１０のステップＳ４０４）。その後、サーバ装置１０は、ステップＳ４０１へ戻り、上述した処理を繰り返し実行する。

【０１１９】

その後、送信周期（変更周期）が経過する毎に、サーバ装置１０は、コンテンツデータを送信している端末装置２０ａ，２０ｂのそれぞれに対して符号化レートを決定し、送信しているコンテンツデータの符号化レートを、決定した符号化レートに変更する。

【０１２０】

その後、現時点の時刻が再生開始時刻T_sに到達すると、端末装置２０ａ及び端末装置２０ｂのそれぞれは、図６のステップＳ３０４にて「Ｙｅｓ」と判定してステップＳ３０７へ進み、記憶装置に記憶されているコンテンツデータに基づいてコンテンツの再生（出力装置への出力）を開始する（図３のステップＳ１１０ａ，Ｓ１１０ｂ）。

【０１２１】

これにより、複数の端末装置２０ａ，２０ｂ間で、コンテンツの再生位置を確実に一致させることができる。即ち、複数の端末装置２０ａ，２０ｂ間で、同一のコンテンツを同期して再生することができる。

【０１２２】

また、この時点にて、サーバ装置１０は、図１０のステップＳ４０１にて「Ｙｅｓ」と判定して、符号化レート変更制御プログラムの実行を終了する。

【０１２３】

これによれば、配信システム１は、残余時間及び再生可能時間の両方に基づいて、サーバ装置１０から端末装置２０ａ，２０ｂへ送信されるコンテンツデータの符号化レートを変更する。これにより、配信システム１は、再生可能時間が比較的短い場合であっても、残余時間が相当長い場合には、符号化レートを比較的大きな値に設定することができる。この結果、符号化レートが無駄に小さくされることを防止することができる。

【０１２４】

また、配信システム１は、再生可能時間が比較的長い場合であっても、残余時間が相当短い場合には、符号化レートを比較的小さな値に設定することができる。この結果、再生開始時刻における再生可能時間を十分に大きくすることができる。従って、端末装置２０ａ，２０ｂが設定された再生開始時刻にてコンテンツの再生を確実に開始することができる。

【０１２５】

このように、上記配信システム１によれば、符号化レートが無駄に小さくされることを防止しながら、端末装置２０ａ，２０ｂが設定された再生開始時刻にてコンテンツの再生を確実に開始することができる。

【０１２６】

更に、上記配信システム１は、再生可能時間が目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を符号化レートとして決定するように構成される。

これによれば、再生開始時刻における再生可能時間を目標再生可能時間に十分に近づけることができる。この結果、符号化レートが無駄に小さくされることを防止しながら、端末装置２０ａ，２０ｂが設定された再生開始時刻にてコンテンツの再生を確実に開始することができる。

【０１２７】

加えて、上記配信システム１は、サーバ装置１０から端末装置２０ａ，２０ｂへ単位時間あたりに送信されたコンテンツデータのデータ量である通信速度を取得し、当該取得された通信速度に残余時間を乗じた値を、目標再生可能時間から再生可能時間を減じた値により除した値を符号化レートとして決定するように構成される。

これにより、再生開始時刻における再生可能時間を目標再生可能時間により一層確実に近づけることができる。

【０１２８】

更に、上記配信システム１は、再生可能時間の目標値である目標再生可能時間に基づいて再生開始時刻を設定するように構成される。

これにより、再生開始時刻における再生可能時間を目標再生可能時間に確実に近づけることができる。

【０１２９】

加えて、上記配信システム１は、複数の端末装置２０ａ，２０ｂのそれぞれに対して、当該端末装置がコンテンツの再生を開始するまでに要する時間である装置毎再生準備時間を算出し、当該算出された装置毎再生準備時間の最大値に基づいて、再生開始時刻を設定するように構成される。

【０１３０】

これにより、複数の端末装置２０ａ，２０ｂのすべてが、再生開始時刻までに再生可能時間を目標再生可能時間に確実に近づけることができる。この結果、複数の端末装置２０ａ，２０ｂ間で、コンテンツの再生位置を確実に一致させることができる。

【０１３１】

更に、上記配信システム１は、端末装置２０ａ，２０ｂがコンテンツを再生するために実行するアプリケーションプログラムが起動するために要する時間である起動時間と、目標再生可能時間と、に基づいて再生開始時刻を設定するように構成される。

これにより、端末装置２０ａ，２０ｂは、再生開始時刻にてコンテンツの再生を確実に開始することができる。

【０１３２】

加えて、上記配信システム１は、サーバ装置１０から端末装置２０ａ，２０ｂへ単位時間あたりに送信されたコンテンツデータのデータ量である通信速度と、目標再生可能時間と、に基づいて再生開始時刻を設定するように構成される。

これにより、再生開始時刻を適切に設定することができる。

【０１３３】

次に、端末装置２０ａ及び端末装置２０ｂが、同一のコンテンツを同期して再生している状態において、端末装置２０ｃが端末装置２０ａ及び端末装置２０ｂと同期してコンテンツを再生することを、端末装置２０ｃのユーザが希望する場合を想定して説明を続ける。

【０１３４】

この場合、端末装置２０ｃのユーザは、セッション参加指示を入力する。これにより、端末装置２０ｃは、受信したセッションＩＤ「Ｓ０１」と、端末ＩＤ「Ｒ０３」と、起動時間「１５００」（ｍｓ）と、通信速度「８」（Ｍｂｐｓ）と、を含むセッション参加要求をサーバ装置１０へ送信する（図６のステップＳ３０１、図１３のステップＳ５０１）。

【０１３５】

サーバ装置１０は、端末装置２０ｃからセッション参加要求を受信すると、図１４に示したように、記憶装置に記憶されているセッション情報のうちの、セッション参加要求に含まれるセッションＩＤ及び端末ＩＤを含むセッション情報に、セッション参加要求に含まれる起動時間及び通信速度を追加する。

【０１３６】

そして、サーバ装置１０は、セッション参加要求を送信してきた端末装置２０ｃに対して、記憶装置に記憶されているコンテンツデータが有する符号化レートのうちの、通信速

度以下であり且つ通信速度に最も近い符号化レートｒを特定する。本例では、サーバ装置１０は、端末装置２０ｃに対する符号化レートｒとして「４Ｍｂｐｓ」を特定する。

【０１３７】

次いで、サーバ装置１０は、セッション参加要求を送信してきた端末装置２０ｃに対して、記憶されているセッション情報に含まれる通信速度Ｂ及び起動時間T_aと、予め設定された目標再生可能時間T_dと、に基づいて装置毎再生準備時間T_pを算出する（図４のステップ２０３）。

【０１３８】

次いで、サーバ装置１０は、算出した装置毎再生準備時間T_pに基づいて再生開始時刻T_s（「１３：０５：２５」）を決定する（図４のステップＳ２０４）。そして、サーバ装置１０は、図１５に示したように、セッションＩＤ「Ｓ０１」及び端末ＩＤ「Ｒ０３」を含むセッション情報に、決定した再生開始時刻を追加する。

【０１３９】

次いで、サーバ装置１０は、セッション参加要求を送信してきた端末装置２０ｃへ、決定した再生開始時刻T_sを送信する（図４のステップＳ２０５、図１３のステップＳ５０２）。これにより、端末装置２０ｃは、サーバ装置１０から再生開始時刻T_sを受信する（図６のステップＳ３０２）。

【０１４０】

そして、サーバ装置１０は、決定した再生開始時刻T_sが、受信したセッション参加要求と同一のセッションＩＤを含む他のセッション参加要求に基づいて決定された再生開始時刻よりも後の時刻であるか否かを判定する（図４のステップＳ２０６）。

【０１４１】

この時点では、端末装置２０ｃ（第２の受信装置）から受信したセッション参加要求に基づいて決定した再生開始時刻（第２の再生開始時刻）は、端末装置２０ａ（第１の受信装置）及び端末装置２０ｂから受信したセッション参加要求に基づいて決定した再生開始時刻（第１の再生開始時刻）よりも後の時刻である。また、端末装置２０ａ及び端末装置２０ｂから受信したセッション参加要求は、端末装置２０ｃから受信したセッション参加要求に含まれるセッションＩＤと同一のセッションＩＤを含む。即ち、上記決定した再生開始時刻T_sは、受信したセッション参加要求と同一のセッションＩＤを含む他のセッション参加要求に基づいて決定された再生開始時刻よりも後の時刻である。

【０１４２】

従って、サーバ装置１０は、「Ｙｅｓ」と判定してステップＳ２０７へ進み、先頭位置から、第１の再生開始時刻と第２の再生開始時刻との差だけ後の位置を送信開始位置として決定する。そして、サーバ装置１０は、ステップＳ２０８へ進み、上記決定した送信開始位置から、端末装置２０ｃへのコンテンツデータの送信を開始する（図１３のステップＳ５０３）。

【０１４３】

このとき、サーバ装置１０が端末装置２０ｃへ送信するコンテンツデータは、セッションＩＤ「Ｓ０１」を含むセッション情報に含まれるコンテンツＩＤ「Ｃ０１」により識別されるコンテンツを表すコンテンツデータである。更に、このコンテンツデータは、端末装置２０ｃから受信したセッション参加要求に含まれる通信速度に基づいて特定された符号化レートにて符号化されたデータである。

【０１４４】

上述した場合と同様に、端末装置２０ｃは、送信周期が経過する毎に、再生可能時間を含む再生可能時間情報をサーバ装置１０へ送信する（図１３のステップＳ５０４）。

そして、サーバ装置１０は、端末装置２０ｃから再生可能時間情報を受信する毎に、端末装置２０ｃに対して符号化レート変更制御を行う（図１３のステップＳ５０５）。

【０１４５】

その後、端末装置２０ｃは、現時点の時刻が、サーバ装置１０から受信した再生開始時刻に到達すると、記憶装置に記憶されているコンテンツデータに基づいてコンテンツの再

生を開始する（図１３のステップＳ５０６）。
【０１４６】
これにより、複数の端末装置２０ａ～２０ｃ間で、コンテンツの再生位置を確実に一致させることができる。即ち、複数の端末装置２０ａ～２０ｃ間で、同一のコンテンツを同期して再生することができる。
【０１４７】
以上、説明したように、本発明の第１実施形態に係る配信システム１によれば、符号化レートが無駄に小さくされることを防止しながら、端末装置２０ａ～２０ｃが設定された再生開始時刻にてコンテンツの再生を確実に開始することができる。
【０１４８】
なお、上記第１実施形態に係る配信システム１は、サーバ装置１０が、残余時間と再生可能時間とに基づいて符号化レートを決定するように構成されていたが、各端末装置２０ａ～２０ｃが、残余時間と再生可能時間とに基づいて符号化レートを決定するように構成されていてもよい。この場合、各端末装置２０ａ～２０ｃは、決定した符号化レートをサーバ装置１０へ送信するように構成される。
【０１４９】
また、上記第１実施形態に係る配信システム１は、複数の端末装置２０ａ～２０ｃのそれぞれが再生するコンテンツの再生位置を当該複数の端末装置２０ａ～２０ｃ間で一致させるように構成されていたが、複数の端末装置２０ａ～２０ｃのそれぞれが再生するコンテンツの再生位置が互いに異なっていてもよい。
【０１５０】
また、上記第１実施形態に係る配信システム１は、端末装置間でコンテンツデータを授受するように構成されていてもよい。
また、上記第１実施形態に係る配信システム１が含む端末装置の数は、３つであったが、２つであってもよく、４つ以上であってもよい。
【０１５１】
なお、上記第１実施形態において配信システム１の各機能は、ＣＰＵがプログラム（ソフトウェア）を実行することにより実現されていたが、回路等のハードウェアにより実現されていてもよい。
【０１５２】
＜第２実施形態＞
次に、本発明の第２実施形態に係る通信システムについて図１６を参照しながら説明する。
第２実施形態に係る配信システム１００は、互いに通信可能に構成された送信装置１１０及び受信装置１２０を含むシステムである。
【０１５３】
送信装置１１０は、１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを受信装置１２０へ送信するコンテンツ送信部（コンテンツ送信手段）１１１を備える。
受信装置１２０は、送信装置１１０により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて上記コンテンツを再生するコンテンツ再生部（コンテンツ再生手段）１２１を備える。
【０１５４】
配信システム１００は、
現時点から、受信装置１２０が上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、受信装置１２０の上記記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて、上記符号化レートを決定する符号化レート決定部（符号化レート決定手段）１３１を備える。

【０１５５】
コンテンツ送信部１１１は、受信装置１２０へ送信するコンテンツデータの上記符号化レートを、上記決定された符号化レートに変更するように構成される。
コンテンツ再生部１２１は、上記設定された再生開始時刻にて、上記コンテンツの再生を開始するように構成される。
【０１５６】
これによれば、配信システム１００は、残余時間及び再生可能時間の両方に基づいて、送信装置１１０から受信装置１２０へ送信されるコンテンツデータの符号化レートを変更する。これにより、配信システム１００は、再生可能時間が比較的短い場合であっても、残余時間が相当長い場合には、符号化レートを比較的大きな値に設定することができる。この結果、符号化レートが無駄に小さくされることを防止することができる。
【０１５７】
また、配信システム１００は、再生可能時間が比較的長い場合であっても、残余時間が相当短い場合には、符号化レートを比較的小さな値に設定することができる。この結果、再生開始時刻における再生可能時間を十分に大きくすることができる。従って、受信装置１２０が設定された再生開始時刻にてコンテンツの再生を確実に開始することができる。
【０１５８】
このように、配信システム１００によれば、符号化レートが無駄に小さくされることを防止しながら、受信装置１２０が設定された再生開始時刻にてコンテンツの再生を確実に開始することができる。
【０１５９】
この場合、上記符号化レート決定手段は、上記再生可能時間が、当該再生可能時間の目標値である目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を上記符号化レートとして決定するように構成されることが好適である。
【０１６０】
これによれば、再生開始時刻における再生可能時間を目標再生可能時間に十分に近づけることができる。この結果、符号化レートが無駄に小さくされることを防止しながら、受信装置が設定された再生開始時刻にてコンテンツの再生を確実に開始することができる。
【０１６１】
この場合、上記符号化レート決定手段は、上記送信装置から上記受信装置へ単位時間あたりに送信されたコンテンツデータのデータ量である通信速度を取得し、当該取得された通信速度に上記残余時間を乗じた値を、上記目標再生可能時間から上記再生可能時間を減じた値により除した値を上記符号化レートとして決定するように構成されることが好適である。
【０１６２】
再生可能時間が増加する程度は、通信速度に応じて変化する。従って、上記のように配信システムを構成することにより、再生開始時刻における再生可能時間を目標再生可能時間により一層確実に近づけることができる。
【０１６３】
この場合、上記符号化レート決定手段は、予め設定された変更周期が経過する毎に、上記符号化レートを決定するように構成されることが好適である。
【０１６４】
この場合、上記配信システムは、
上記受信装置を複数含み、
上記複数の受信装置のそれぞれが再生するコンテンツの再生位置を当該複数の受信装置間で一致させる同期再生制御手段を備えることが好適である。
【０１６５】
これによれば、複数の受信装置間で、コンテンツの再生位置を確実に一致させることができる。

【０１６６】
この場合、上記配信システムは、
上記再生可能時間の目標値である目標再生可能時間に基づいて上記再生開始時刻を設定する再生開始時刻設定手段を備えることが好適である。
【０１６７】
目標再生可能時間が長くなるほど、再生可能時間が目標再生可能時間に一致するまでに要する時間が長くなる。従って、上記構成のように、目標再生可能時間に基づいて再生開始時刻を設定することにより、再生開始時刻における再生可能時間を目標再生可能時間に確実に近づけることができる。
【０１６８】
この場合、上記コンテンツ送信手段は、上記複数の受信装置の１つである第１の受信装置に対して設定された再生開始時刻である第１の再生開始時刻よりも、当該複数の受信装置の他の１つである第２の受信装置に対して設定された再生開始時刻である第２の再生開始時刻が後の時刻である場合、当該第２の再生開始時刻にて当該第１の受信装置が再生しているコンテンツの再生位置を推定し、上記コンテンツデータのうちの、当該推定された再生位置以降の部分を当該第２の受信装置へ送信するように構成されることが好適である。
【０１６９】
この場合、上記再生開始時刻設定手段は、上記複数の受信装置のそれぞれに対して、当該受信装置が上記コンテンツの再生を開始するまでに要する時間である装置毎再生準備時間を算出し、当該算出された装置毎再生準備時間の最大値に基づいて、上記再生開始時刻を設定するように構成されることが好適である。
【０１７０】
ところで、複数の受信装置間で受信速度が相違することが多い。従って、上記のように配信システムを構成することにより、複数の受信装置のすべてが、再生開始時刻までに再生可能時間を目標再生可能時間に確実に近づけることができる。この結果、複数の受信装置間で、コンテンツの再生位置を確実に一致させることができる。
【０１７１】
この場合、上記再生開始時刻設定手段は、上記受信装置が上記コンテンツを再生するために実行するアプリケーションプログラムが起動するために要する時間である起動時間と、上記目標再生可能時間と、に基づいて上記再生開始時刻を設定するように構成されることが好適である。
【０１７２】
ところで、受信装置がコンテンツの再生を開始するまでに要する時間は、起動時間と、再生可能時間が目標再生可能時間に到達するまでに要する時間と、を含む。従って、上記のように配信システムを構成することにより、受信装置は、再生開始時刻にてコンテンツの再生を確実に開始することができる。
【０１７３】
この場合、上記再生開始時刻設定手段は、上記送信装置から上記受信装置へ単位時間あたりに送信されたコンテンツデータのデータ量である通信速度と、上記目標再生可能時間と、に基づいて上記再生開始時刻を設定するように構成されることが好適である。
【０１７４】
ところで、再生可能時間が目標再生可能時間に到達するまでに要する時間は、通信速度に応じて変動する。従って、上記のように配信システムを構成することにより、再生開始時刻を適切に設定することができる。
【０１７５】
また、本発明の他の形態である配信方法は、
互いに通信可能に構成された送信装置及び受信装置を含む配信システムに適用され、
上記送信装置が、１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを上記受信装置へ送信し、

上記受信装置が、上記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて上記コンテンツを再生し、
現時点から、上記受信装置が上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記受信装置の上記記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて、上記符号化レートを決定し、
上記送信装置が上記受信装置へ送信するコンテンツデータの上記符号化レートを、上記決定された符号化レートに変更し、
上記受信装置は、上記設定された再生開始時刻にて、上記コンテンツの再生を開始する方法である。
【０１７６】
この場合、上記配信方法は、
上記再生可能時間が、当該再生可能時間の目標値である目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を上記符号化レートとして決定するように構成されることが好適である。
【０１７７】
この場合、上記配信方法は、
上記送信装置から上記受信装置へ単位時間あたりに送信されたコンテンツデータのデータ量である通信速度を取得し、当該取得された通信速度に上記残余時間を乗じた値を、上記目標再生可能時間から上記再生可能時間を減じた値により除した値を上記符号化レートとして決定するように構成されることが好適である。
【０１７８】
この場合、上記配信方法は、
予め設定された変更周期が経過する毎に、上記符号化レートを決定するように構成されることが好適である。
【０１７９】
この場合、上記配信方法は、
上記配信システムが、上記受信装置を複数含み、
上記複数の受信装置のそれぞれが再生するコンテンツの再生位置を当該複数の受信装置間で一致させることが好適である。
【０１８０】
また、本発明の他の形態である送信装置は、受信装置と通信可能に構成された装置である。
更に、この送信装置は、
１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを上記受信装置へ送信するコンテンツ送信手段を備え、
上記コンテンツ送信手段は、現時点から、上記受信装置が上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記受信装置の記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて決定された符号化レートに、上記受信装置へ送信する上記コンテンツデータの符号化レートを変更するように構成される。
【０１８１】
この場合、上記送信装置は、
上記残余時間と上記再生可能時間とに基づいて上記符号化レートを決定する符号化レート決定手段を備えることが好適である。
【０１８２】
この場合、上記符号化レート決定手段は、上記再生可能時間が、当該再生可能時間の目標値である目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を上記符号化レートとして決定するように構成されることが好適である

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【０１８３】
この場合、上記符号化レート決定手段は、上記送信装置から上記受信装置へ単位時間あたりに送信されたコンテンツデータのデータ量である通信速度を取得し、当該取得された通信速度に上記残余時間を乗じた値を、上記目標再生可能時間から上記再生可能時間を減じた値により除した値を上記符号化レートとして決定するように構成されることが好適である。
【０１８４】
この場合、上記符号化レート決定手段は、予め設定された変更周期が経過する毎に、上記符号化レートを決定するように構成されることが好適である。
【０１８５】
また、本発明の他の形態であるプログラムは、
受信装置と通信可能に構成された送信装置に、
１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを上記受信装置へ送信するコンテンツ送信手段を実現させるとともに、
上記コンテンツ送信手段は、現時点から、上記受信装置が上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記受信装置の記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて決定された符号化レートに、上記受信装置へ送信する上記コンテンツデータの符号化レートを変更するように構成される。
【０１８６】
また、本発明の他の形態である受信装置は、送信装置と通信可能に構成された装置である。
更に、この受信装置は、
１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化され且つ上記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて上記コンテンツを再生するコンテンツ再生手段と、
現時点から、上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて、上記符号化レートを決定する符号化レート決定手段と、を備え、
上記コンテンツ再生手段は、上記決定された符号化レートにて符号化されたコンテンツデータを受信するように構成され、且つ、上記設定された再生開始時刻にて、上記コンテンツの再生を開始するように構成される。
【０１８７】
この場合、上記符号化レート決定手段は、上記再生可能時間が、当該再生可能時間の目標値である目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を上記符号化レートとして決定するように構成されることが好適である。
【０１８８】
この場合、上記符号化レート決定手段は、上記送信装置から単位時間あたりに送信されたコンテンツデータのデータ量である通信速度を取得し、当該取得された通信速度に上記残余時間を乗じた値を、上記目標再生可能時間から上記再生可能時間を減じた値により除した値を上記符号化レートとして決定するように構成されることが好適である。
【０１８９】
この場合、上記符号化レート決定手段は、予め設定された変更周期が経過する毎に、上記符号化レートを決定するように構成されることが好適である。
【０１９０】

また、本発明の他の形態であるプログラムは、
送信装置と通信可能に構成された受信装置に、
１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化され且つ上記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて上記コンテンツを再生するコンテンツ再生手段と、
現時点から、上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて、上記符号化レートを決定する符号化レート決定手段と、を実現させるとともに、
上記コンテンツ再生手段は、上記決定された符号化レートにて符号化されたコンテンツデータを受信するように構成され、且つ、上記設定された再生開始時刻にて、上記コンテンツの再生を開始するように構成される。

【０１９１】

上述した構成を有する、配信方法、送信装置、プログラム、又は、受信装置、の発明であっても、上記配信システムと同様の作用を有するために、上述した本発明の目的を達成することができる。

【０１９２】

以上、上記実施形態を参照して本願発明を説明したが、本願発明は、上述した実施形態に限定されるものではない。本願発明の構成及び詳細に、本願発明の範囲内において当業者が理解し得る様々な変更をすることができる。

【０１９３】

また、上記各実施形態においてプログラムは、記憶装置に記憶されていたが、コンピュータが読み取り可能な記録媒体に記憶されていてもよい。例えば、記録媒体は、フレキシブルディスク、光ディスク、光磁気ディスク、及び、半導体メモリ等の可搬性を有する媒体である。

【０１９４】

また、上記実施形態の他の変形例として、上述した実施形態及び変形例の任意の組み合わせが採用されてもよい。

【産業上の利用可能性】

【０１９５】

本発明は、コンテンツを表すコンテンツデータを送信装置から受信装置へ送信する配信システム等に適用可能である。

【符号の説明】

【０１９６】

１　　配信システム
１０　　サーバ装置
２０ａ，２０ｂ，２０ｃ　端末装置
３１　　要求送信部
３２　　同期再生制御部
３２ａ　再生開始時刻受信部
３３　　コンテンツ再生部
３３ａ　コンテンツ受信部
３３ｂ　バッファ部
３３ｃ　コンテンツ再生実行部
３４　　再生可能時間送信部
４１　　要求受信部
４２　　セッション情報記憶部
４３　　再生開始時刻設定部
４３ａ　再生開始時刻決定部

４３ｂ　再生開始時刻送信部
４４　　コンテンツデータ記憶部
４５　　コンテンツ送信部
４６　　再生可能時間受信部
４７　　符号化レート決定部
１００　配信システム
１１０　送信装置
１１１　コンテンツ送信部
１２０　受信装置
１２１　コンテンツ再生部
１３１　符号化レート決定部
ＮＷ　　通信回線

【書類名】特許請求の範囲
【請求項１】
　互いに通信可能に構成された送信装置及び受信装置を含む配信システムであって、
　前記送信装置は、１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを前記受信装置へ送信するコンテンツ送信手段を備え、
　前記受信装置は、前記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて前記コンテンツを再生するコンテンツ再生手段を備え、
　前記配信システムは、
　現時点から、前記受信装置が前記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、前記受信装置の前記記憶装置に記憶されている前記コンテンツデータに基づいて前記コンテンツを再生可能な時間である再生可能時間と、に基づいて、前記符号化レートを決定する符号化レート決定手段を備え、
　前記コンテンツ送信手段は、前記受信装置へ送信するコンテンツデータの前記符号化レートを、前記決定された符号化レートに変更するように構成され、
　前記コンテンツ再生手段は、前記設定された再生開始時刻にて、前記コンテンツの再生を開始するように構成された配信システム。
【請求項２】
　請求項１に記載の配信システムであって、
　前記符号化レート決定手段は、前記再生可能時間が、当該再生可能時間の目標値である目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を前記符号化レートとして決定するように構成された配信システム。
【請求項３】
　請求項２に記載の配信システムであって、
　前記符号化レート決定手段は、前記送信装置から前記受信装置へ単位時間あたりに送信されたコンテンツデータのデータ量である通信速度を取得し、当該取得された通信速度に前記残余時間を乗じた値を、前記目標再生可能時間から前記再生可能時間を減じた値により除した値を前記符号化レートとして決定するように構成された配信システム。
【請求項４】
　請求項１乃至請求項３のいずれか一項に記載の配信システムであって、
　前記符号化レート決定手段は、予め設定された変更周期が経過する毎に、前記符号化レートを決定するように構成された配信システム。
【請求項５】
　請求項１乃至請求項４のいずれか一項に記載の配信システムであって、
　前記受信装置を複数含み、
　前記複数の受信装置のそれぞれが再生するコンテンツの再生位置を当該複数の受信装置間で一致させる同期再生制御手段を備える配信システム。
【請求項６】
　請求項５に記載の配信システムであって、
　前記再生可能時間の目標値である目標再生可能時間に基づいて前記再生開始時刻を設定する再生開始時刻設定手段を備える配信システム。
【請求項７】
　請求項５又は請求項６に記載の配信システムであって、
　前記コンテンツ送信手段は、前記複数の受信装置の１つである第１の受信装置に対して設定された再生開始時刻である第１の再生開始時刻よりも、当該複数の受信装置の他の１つである第２の受信装置に対して設定された再生開始時刻である第２の再生開始時刻が後の時刻である場合、当該第２の再生開始時刻にて当該第１の受信装置が再生しているコンテンツの再生位置を推定し、前記コンテンツデータのうちの、当該推定された再生位置以降の部分を当該第２の受信装置へ送信するように構成された配信システム。

【請求項８】
　請求項６又は請求項７に記載の配信システムであって、
　前記再生開始時刻設定手段は、前記複数の受信装置のそれぞれに対して、当該受信装置が前記コンテンツの再生を開始するまでに要する時間である装置毎再生準備時間を算出し、当該算出された装置毎再生準備時間の最大値に基づいて、前記再生開始時刻を設定するように構成された配信システム。
【請求項９】
　請求項６乃至請求項８のいずれか一項に記載の配信システムであって、
　前記再生開始時刻設定手段は、前記受信装置が前記コンテンツを再生するために実行するアプリケーションプログラムが起動するために要する時間である起動時間と、前記目標再生可能時間と、に基づいて前記再生開始時刻を設定するように構成された配信システム。
【請求項１０】
　請求項６乃至請求項９のいずれか一項に記載の配信システムであって、
　前記再生開始時刻設定手段は、前記送信装置から前記受信装置へ単位時間あたりに送信されたコンテンツデータのデータ量である通信速度と、前記目標再生可能時間と、に基づいて前記再生開始時刻を設定するように構成された配信システム。
【請求項１１】
　互いに通信可能に構成された送信装置及び受信装置を含む配信システムに適用され、
　前記送信装置が、１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを前記受信装置へ送信し、
　前記受信装置が、前記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて前記コンテンツを再生し、
　現時点から、前記受信装置が前記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、前記受信装置の前記記憶装置に記憶されている前記コンテンツデータに基づいて前記コンテンツを再生可能な時間である再生可能時間と、に基づいて、前記符号化レートを決定し、
　前記送信装置が前記受信装置へ送信するコンテンツデータの前記符号化レートを、前記決定された符号化レートに変更し、
　前記受信装置は、前記設定された再生開始時刻にて、前記コンテンツの再生を開始する、配信方法。
【請求項１２】
　請求項１１に記載の配信方法であって、
　前記再生可能時間が、当該再生可能時間の目標値である目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を前記符号化レートとして決定するように構成された配信方法。
【請求項１３】
　請求項１２に記載の配信方法であって、
　前記送信装置から前記受信装置へ単位時間あたりに送信されたコンテンツデータのデータ量である通信速度を取得し、当該取得された通信速度に前記残余時間を乗じた値を、前記目標再生可能時間から前記再生可能時間を減じた値により除した値を前記符号化レートとして決定するように構成された配信方法。
【請求項１４】
　請求項１１乃至請求項１３のいずれか一項に記載の配信方法であって、
　予め設定された変更周期が経過する毎に、前記符号化レートを決定するように構成された配信方法。
【請求項１５】
　請求項１１乃至請求項１４のいずれか一項に記載の配信方法であって、
　前記配信システムは、前記受信装置を複数含み、

前記複数の受信装置のそれぞれが再生するコンテンツの再生位置を当該複数の受信装置間で一致させる、配信方法。
【請求項１６】
受信装置と通信可能に構成された送信装置であって、
１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを前記受信装置へ送信するコンテンツ送信手段を備え、
前記コンテンツ送信手段は、現時点から、前記受信装置が前記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、前記受信装置の記憶装置に記憶されている前記コンテンツデータに基づいて前記コンテンツを再生可能な時間である再生可能時間と、に基づいて決定された符号化レートに、前記受信装置へ送信する前記コンテンツデータの符号化レートを変更するように構成された送信装置。
【請求項１７】
請求項１６に記載の送信装置であって、
前記残余時間と前記再生可能時間とに基づいて前記符号化レートを決定する符号化レート決定手段を備える送信装置。
【請求項１８】
請求項１６又は請求項１７に記載の送信装置であって、
前記符号化レート決定手段は、前記再生可能時間が、当該再生可能時間の目標値である目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を前記符号化レートとして決定するように構成された送信装置。
【請求項１９】
請求項１８に記載の送信装置であって、
前記符号化レート決定手段は、前記送信装置から前記受信装置へ単位時間あたりに送信されたコンテンツデータのデータ量である通信速度を取得し、当該取得された通信速度に前記残余時間を乗じた値を、前記目標再生可能時間から前記再生可能時間を減じた値により除した値を前記符号化レートとして決定するように構成された送信装置。
【請求項２０】
請求項１６乃至請求項１９のいずれか一項に記載の送信装置であって、
前記符号化レート決定手段は、予め設定された変更周期が経過する毎に、前記符号化レートを決定するように構成された送信装置。
【請求項２１】
受信装置と通信可能に構成された送信装置に、
１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを前記受信装置へ送信するコンテンツ送信手段を実現させるとともに、
前記コンテンツ送信手段は、現時点から、前記受信装置が前記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、前記受信装置の記憶装置に記憶されている前記コンテンツデータに基づいて前記コンテンツを再生可能な時間である再生可能時間と、に基づいて決定された符号化レートに、前記受信装置へ送信する前記コンテンツデータの符号化レートを変更するように構成されたプログラム。
【請求項２２】
送信装置と通信可能に構成された受信装置であって、
１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化され且つ前記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて前記コンテンツを再生するコンテンツ再生手段と、
現時点から、前記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、前記記憶装置に記憶されている前記コンテンツデータに基づいて前記コンテンツを再生可能な時間である再生可能時間と、に基づいて、前記符号化レートを決定する符号化レート決定手段と、を備え、

前記コンテンツ再生手段は、前記決定された符号化レートにて符号化されたコンテンツデータを受信するように構成され、且つ、前記設定された再生開始時刻にて、前記コンテンツの再生を開始するように構成された受信装置。

【請求項２３】

請求項２２に記載の受信装置であって、

前記符号化レート決定手段は、前記再生可能時間が、当該再生可能時間の目標値である目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を前記符号化レートとして決定するように構成された受信装置。

【請求項２４】

請求項２３に記載の受信装置であって、

前記符号化レート決定手段は、前記送信装置から単位時間あたりに送信されたコンテンツデータのデータ量である通信速度を取得し、当該取得された通信速度に前記残余時間を乗じた値を、前記目標再生可能時間から前記再生可能時間を減じた値により除した値を前記符号化レートとして決定するように構成された受信装置。

【請求項２５】

請求項２２乃至請求項２４のいずれか一項に記載の受信装置であって、

前記符号化レート決定手段は、予め設定された変更周期が経過する毎に、前記符号化レートを決定するように構成された受信装置。

【請求項２６】

送信装置と通信可能に構成された受信装置に、

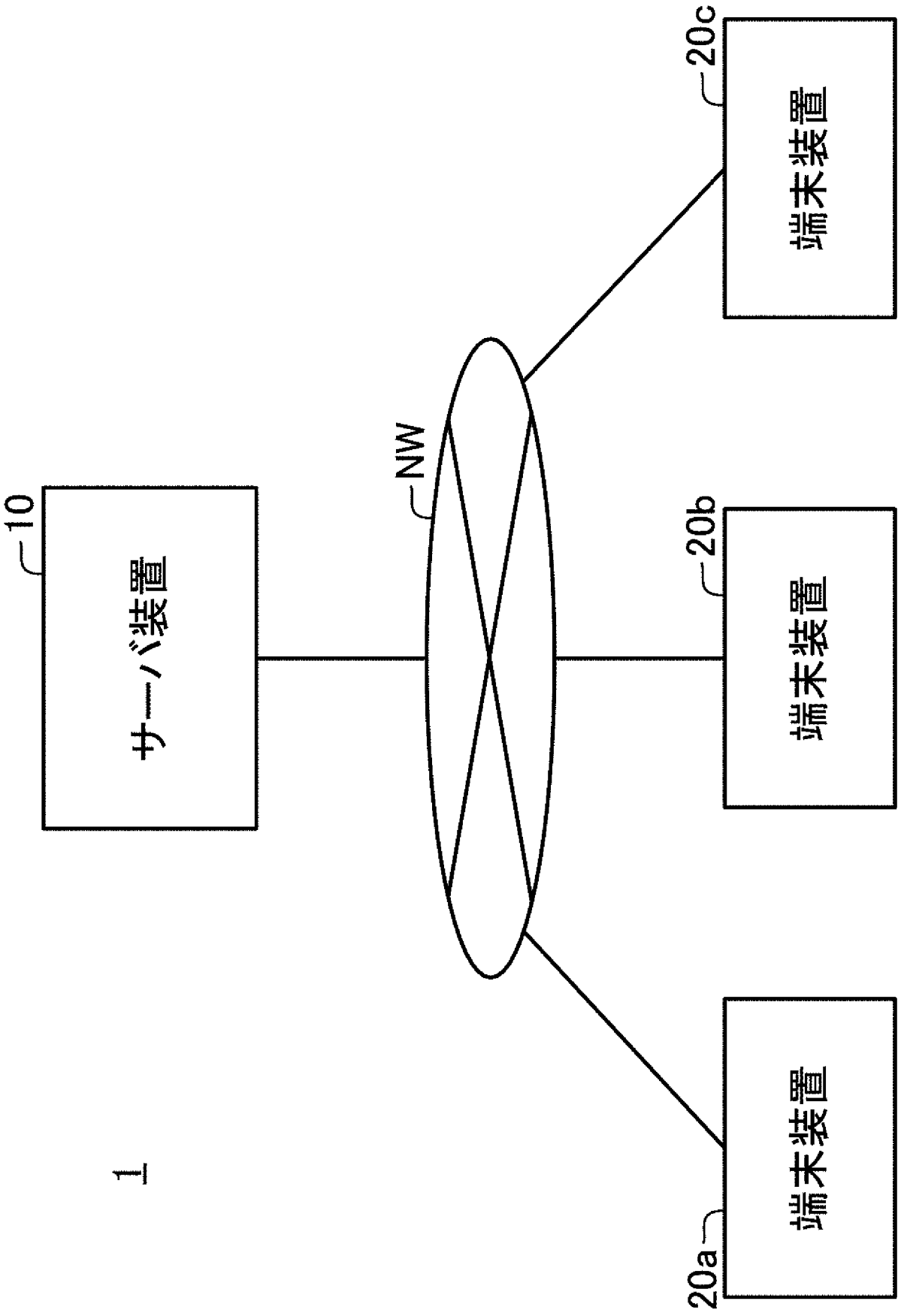
１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化され且つ前記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて前記コンテンツを再生するコンテンツ再生手段と、

現時点から、前記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、前記記憶装置に記憶されている前記コンテンツデータに基づいて前記コンテンツを再生可能な時間である再生可能時間と、に基づいて、前記符号化レートを決定する符号化レート決定手段と、を実現させるとともに、

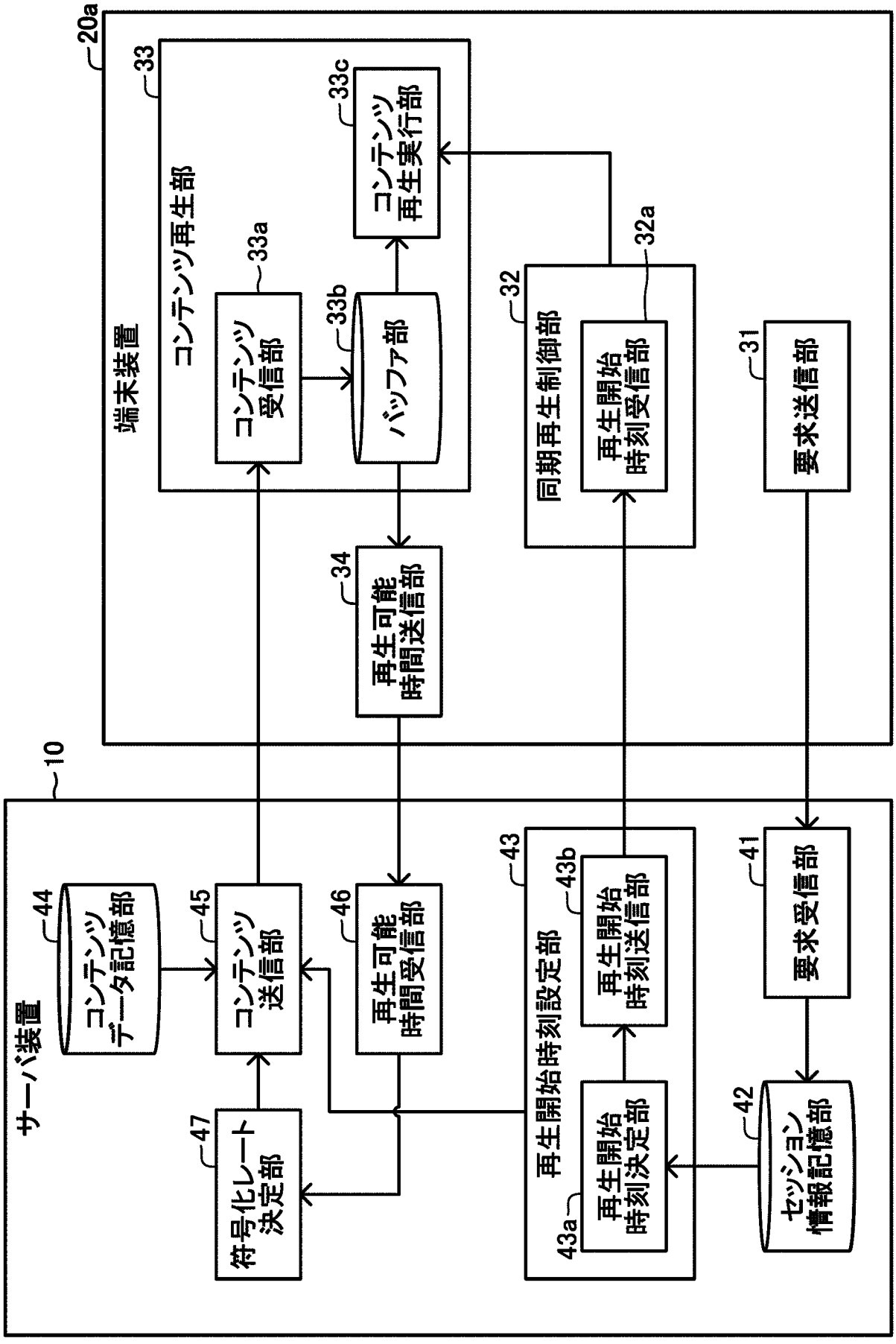
前記コンテンツ再生手段は、前記決定された符号化レートにて符号化されたコンテンツデータを受信するように構成され、且つ、前記設定された再生開始時刻にて、前記コンテンツの再生を開始するように構成されたプログラム。

【書類名】要約書
【要約】
【課題】符号化レートが無駄に小さくされることを防止し、受信装置が設定された再生開始時刻にてコンテンツの再生を確実に開始できる配信システムを提供すること。
【解決手段】配信システム１００は、送信装置１１０及び受信装置１２０を含む。送信装置は、ある符号化レートにて符号化されたコンテンツデータを受信装置へ送信する。受信装置は、送信装置により送信されたコンテンツデータを受信しながら、受信されたデータを記憶装置に記憶させるとともに記憶されているデータに基づいてコンテンツを再生する。配信システムは、現時点から再生開始時刻までの残余時間と、記憶されているデータに基づいてコンテンツを再生可能な時間である再生可能時間と、に基づいて符号化レートを決定する。送信装置は、送信するコンテンツデータの符号化レートを、決定された符号化レートに変更する。受信装置は、再生開始時刻にてコンテンツの再生を開始する。
【選択図】図１６

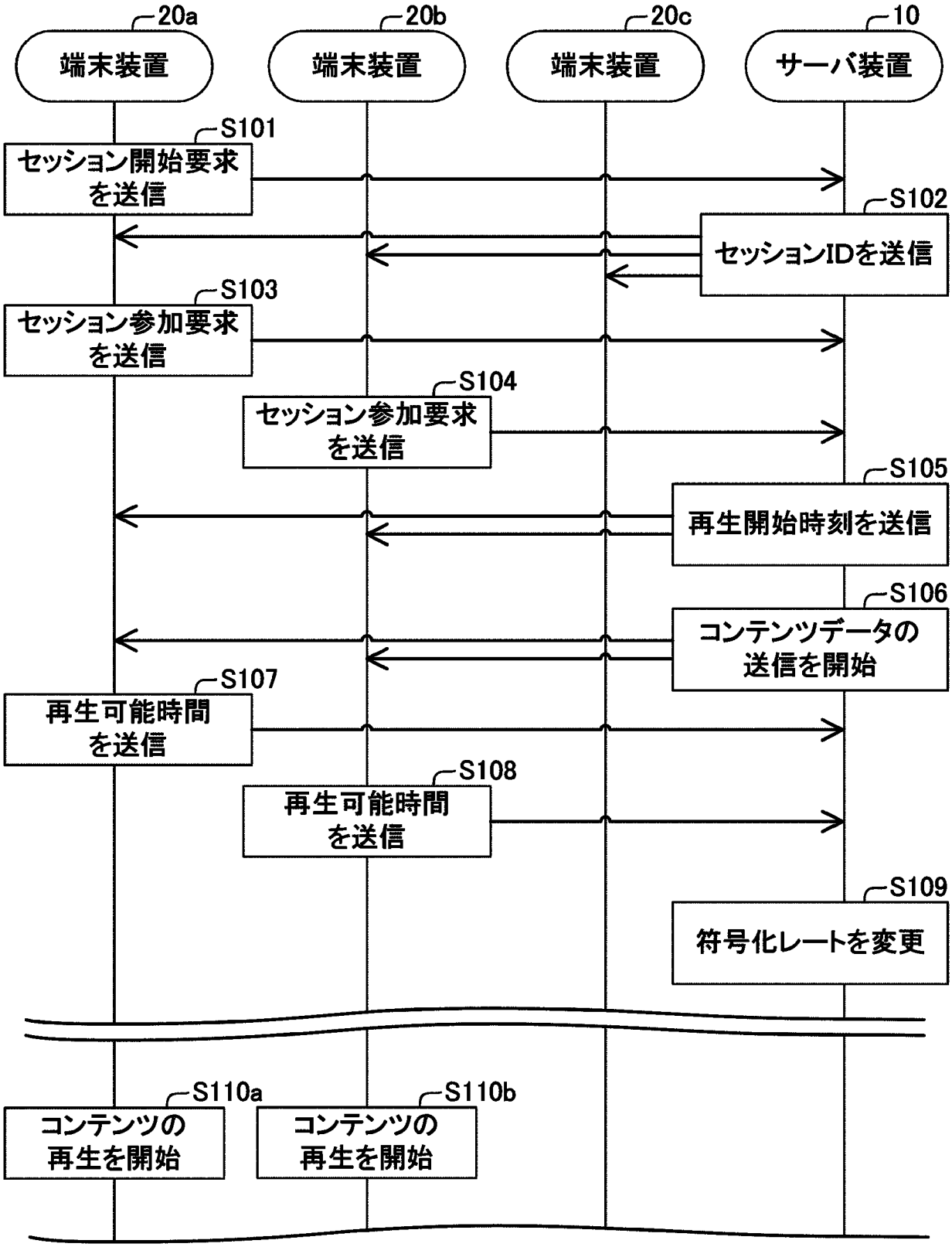
【書類名】図面
【図１】



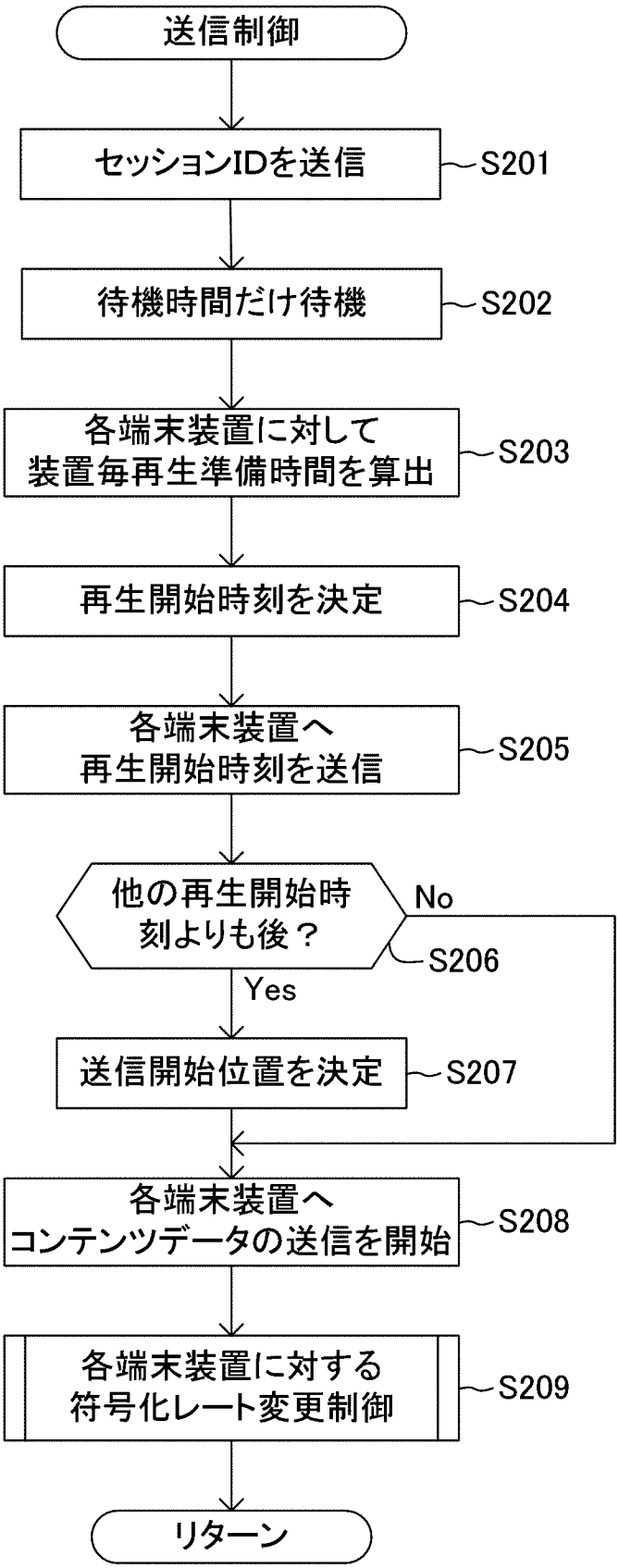
【図２】


20a
端末装置
33
コンテンツ再生部
33c
コンテンツ
再生実行部
33a
コンテンツ
受信部
33b
バッファ部
32
同期再生制御部
32a
再生開始
時刻受信部
31
要求送信部
34
再生可能
時間送信部
10
サーバ装置
44
コンテンツ
データ記憶部
45
コンテンツ
送信部
46
再生可能
時間受信部
43
再生開始時刻設定部
43b
再生開始
時刻送信部
41
要求受信部
47
符号化レート
決定部
43a
再生開始
時刻決定部
42
セッション
情報記憶部

【図３】


20a
端末装置
20b
端末装置
20c
端末装置
10
サーバ装置
S101
セッション開始要求を送信
S102
セッションIDを送信
S103
セッション参加要求を送信
S104
セッション参加要求を送信
S105
再生開始時刻を送信
S106
コンテンツデータの送信を開始
S107
再生可能時間を送信
S108
再生可能時間を送信
S109
符号化レートを変更
S110a
コンテンツの再生を開始
S110b
コンテンツの再生を開始

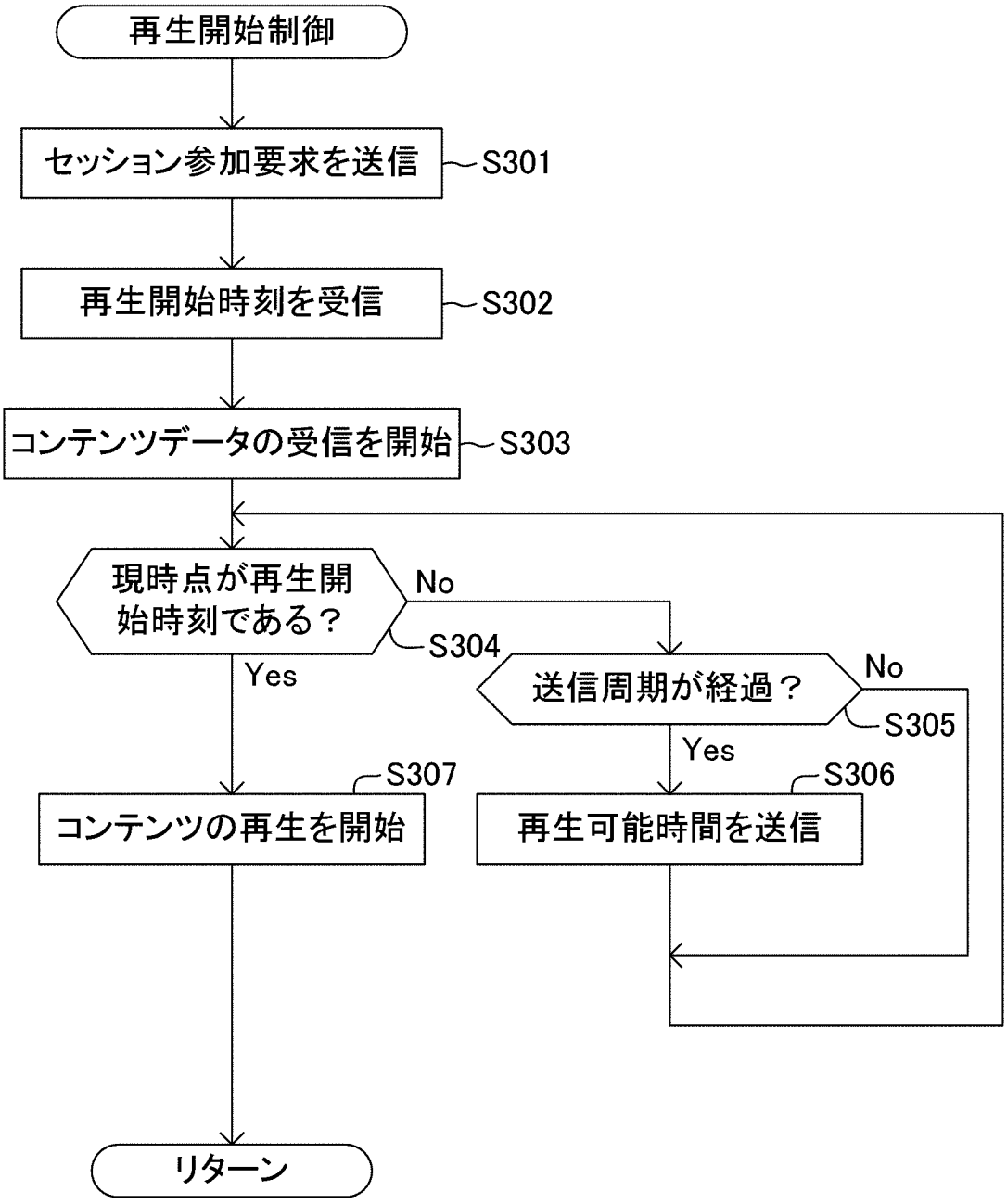
【図４】


送信制御
セッションIDを送信
S201
待機時間だけ待機
S202
各端末装置に対して
装置毎再生準備時間を算出
S203
再生開始時刻を決定
S204
各端末装置へ
再生開始時刻を送信
S205
他の再生開始時
刻よりも後？
No
S206
Yes
送信開始位置を決定
S207
各端末装置へ
コンテンツデータの送信を開始
S208
各端末装置に対する
符号化レート変更制御
S209
リターン

【図５】

セッションID	コンテンツID	端末ID	起動時間	通信速度	再生開始時刻
S01	C01	R01			
S01	C01	R02			
S01	C01	R03			
⋮	⋮	⋮	⋮	⋮	⋮

【図６】



【図７】

セッションID	コンテンツID	端末ID	起動時間	通信速度	再生開始時刻
S01	C01	R01	1200	3	
S01	C01	R02	1000	50	
S01	C01	R03			
⋮	⋮	⋮	⋮	⋮	⋮

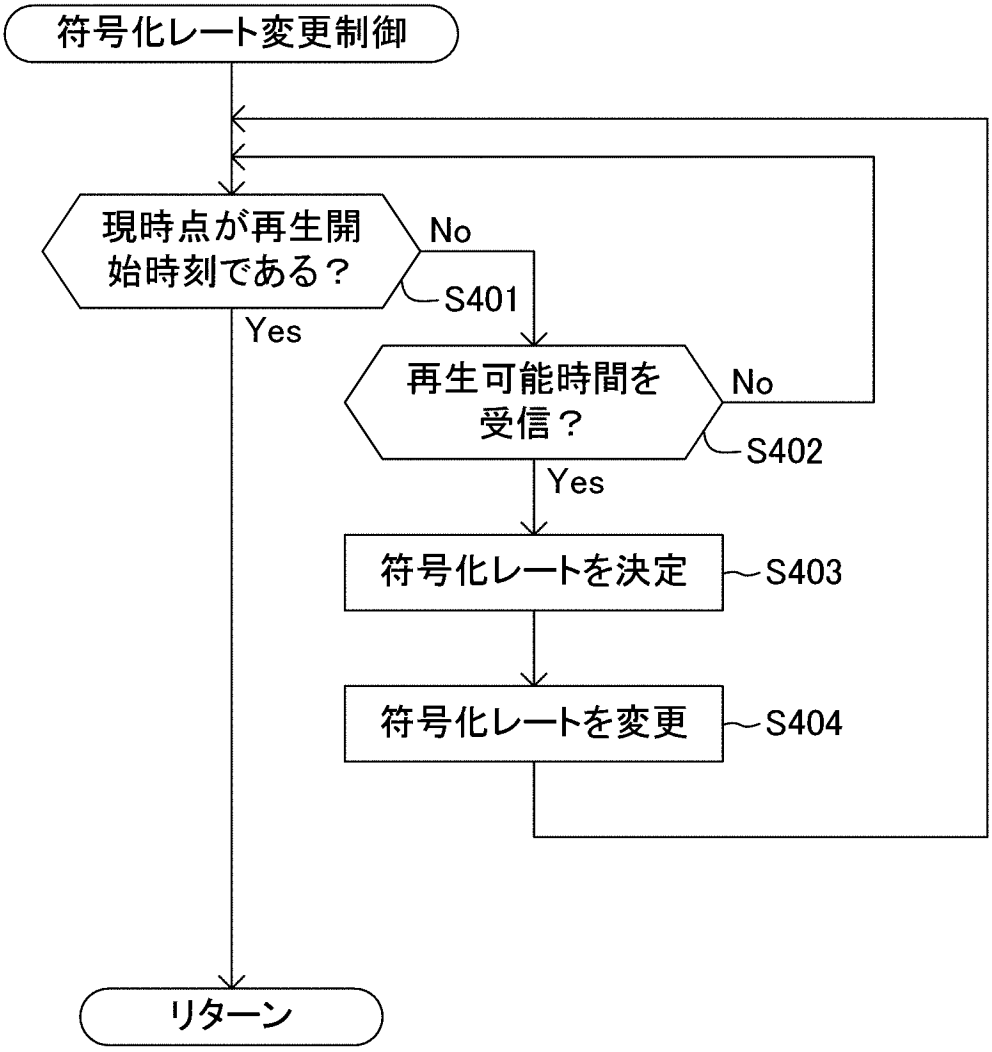
【図８】

セッションID	コンテンツID	端末ID	起動時間	通信速度	再生開始時刻
S01	C01	R01	1200	3	13:01:34
S01	C01	R02	1000	50	13:01:34
S01	C01	R03			
⋮	⋮	⋮	⋮	⋮	⋮

【図９】

セッションID	端末ID	再生可能時間	残余時間	符号化レート
S01	R01	0	31	2
S01	R02	0	31	50
⋮	⋮	⋮	⋮	⋮

【図１０】



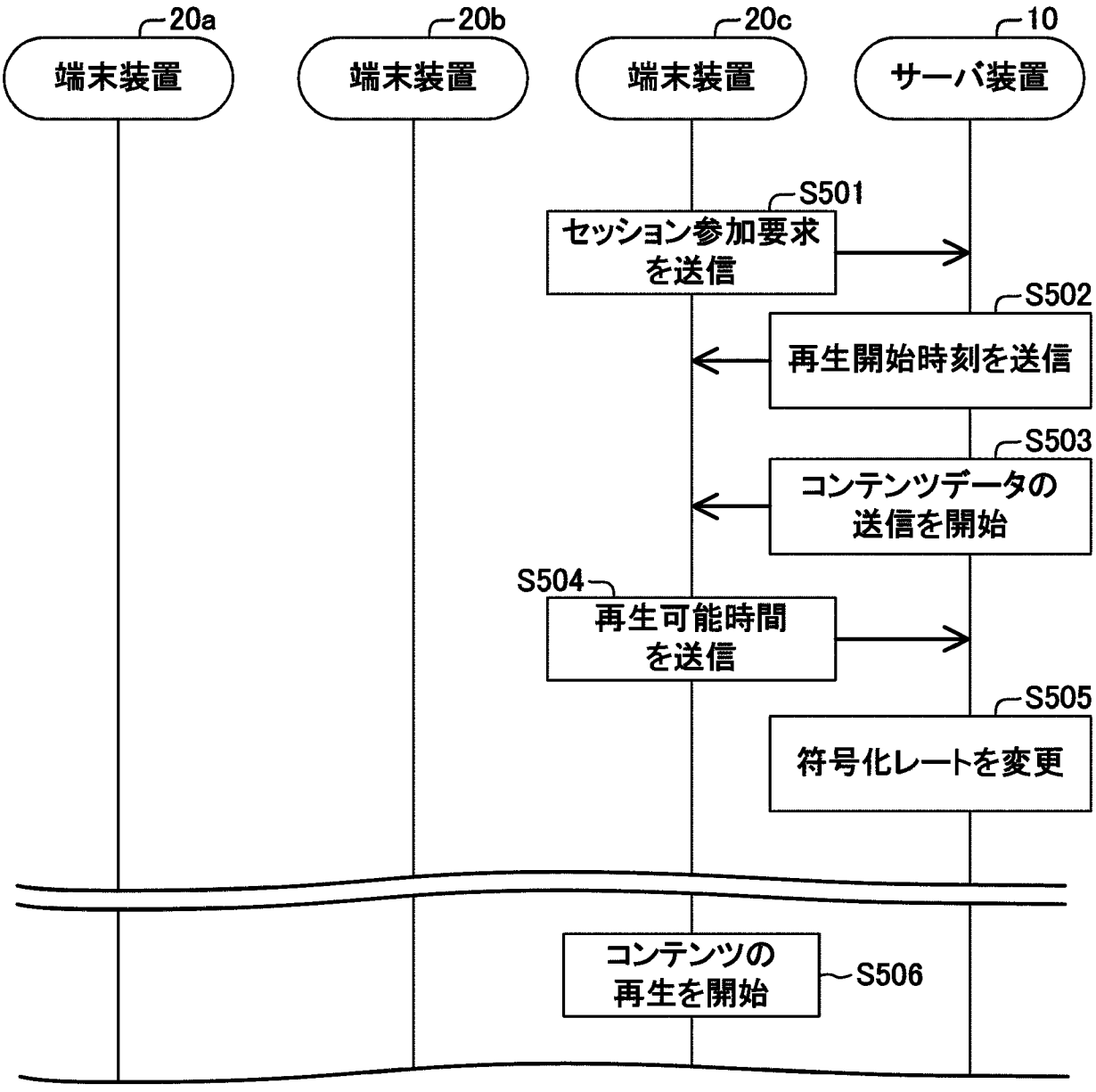
【図１１】

セッションID	端末ID	再生可能時間	残余時間	符号化レート
S01	R01	0	31	2
S01	R02	0	31	50
S01	R01	7	26	2
S01	R02	2	26	16
⋮	⋮	⋮	⋮	⋮

【図１２】

セッションID	端末ID	再生可能時間	残余時間	符号化レート
S01	R01	0	31	2
S01	R02	0	31	50
S01	R01	7	26	2
S01	R02	2	26	16
S01	R01	18	21	4
S01	R02	14	21	50
⋮	⋮	⋮	⋮	⋮

【図１３】



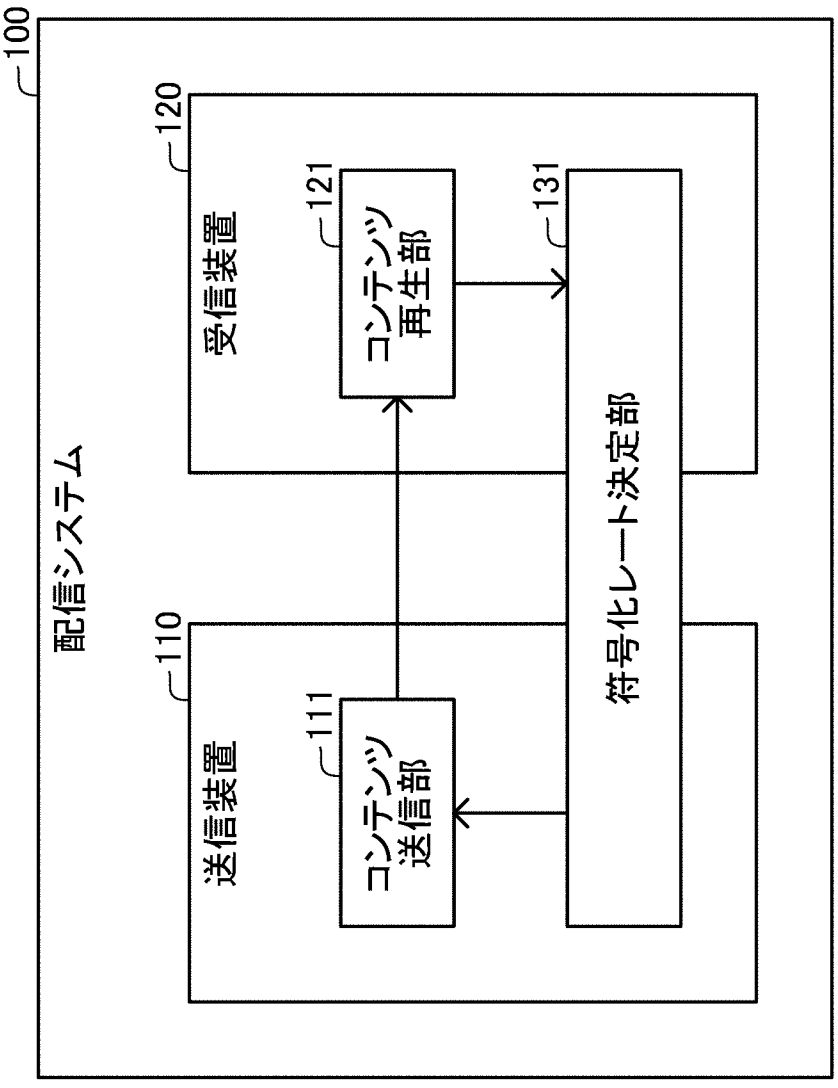
【図１４】

セッションID	コンテンツID	端末ID	起動時間	通信速度	再生開始時刻
S01	C01	R01	1200	3	13:01:34
S01	C01	R02	1000	50	13:01:34
S01	C01	R03	1500	8	
⋮	⋮	⋮	⋮	⋮	⋮

【図１５】

セッションID	コンテンツID	端末ID	起動時間	通信速度	再生開始時刻
S01	C01	R01	1200	3	13:01:34
S01	C01	R02	1000	50	13:01:34
S01	C01	R03	1500	8	13:05:25
⋮	⋮	⋮	⋮	⋮	⋮

【図１６】



出願人履歴

０００００４２３７

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国際調査報告

国際出願番号　ＰＣＴ／ＪＰ２０１０／００６０６７

Ａ．　発明の属する分野の分類（国際特許分類（ＩＰＣ））

Int.Cl.　H04N7/173(2006.01)i

Ｂ．　調査を行った分野

調査を行った最小限資料（国際特許分類（ＩＰＣ））

Int.Cl.　H04N7/173

最小限資料以外の資料で調査を行った分野に含まれるもの

日本国実用新案公報	１９２２－１９９６年
日本国公開実用新案公報	１９７１－２０１０年
日本国実用新案登録公報	１９９６－２０１０年
日本国登録実用新案公報	１９９４－２０１０年

国際調査で使用した電子データベース（データベースの名称、調査に使用した用語）

ＣＳＤＢ（日本国特許庁），
ＪＳＴＰｌｕｓ（ＪＤｒｅａｍ２）

Ｃ．　関連すると認められる文献

引用文献のカテゴリー＊	引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求項の番号
Ａ	酒澤茂之，外３名，「ＴＣＰビデオストリーミングの動的レート制御方式の検討」，電子情報通信学会技術研究報告，２００２年１１月１５日，第１０２巻，第４６９号，第１９－２４頁，ＩＳＳＮ：０９１３－５６８５，特に、第２１頁右コラム第２行－第２２頁左コラム第７行の記載及び第２２頁左コラムの末尾１１行の記載.	１－２６

☑　Ｃ欄の続きにも文献が列挙されている。　　☐　パテントファミリーに関する別紙を参照。

＊　引用文献のカテゴリー
「Ａ」特に関連のある文献ではなく、一般的技術水準を示すもの
「Ｅ」国際出願日前の出願または特許であるが、国際出願日以後に公表されたもの
「Ｌ」優先権主張に疑義を提起する文献又は他の文献の発行日若しくは他の特別な理由を確立するために引用する文献（理由を付す）
「Ｏ」口頭による開示、使用、展示等に言及する文献
「Ｐ」国際出願日前で、かつ優先権の主張の基礎となる出願の日の後に公表された文献
「Ｔ」国際出願日又は優先日後に公表された文献であって出願と矛盾するものではなく、発明の原理又は理論の理解のために引用するもの
「Ｘ」特に関連のある文献であって、当該文献のみで発明の新規性又は進歩性がないと考えられるもの
「Ｙ」特に関連のある文献であって、当該文献と他の１以上の文献との、当業者にとって自明である組合せによって進歩性がないと考えられるもの
「＆」同一パテントファミリー文献

国際調査を完了した日	国際調査報告の発送日
２７．１０．２０１０	０９．１１．２０１０

国際調査機関の名称及びあて先
日本国特許庁（ＩＳＡ／ＪＰ）
郵便番号１００－８９１５
東京都千代田区霞が関三丁目４番３号

特許庁審査官（権限のある職員）　５Ｃ　９１８９
久保　光宏
電話番号　０３－３５８１－１１０１　内線　３５４１

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Ｃ（続き）．　関連すると認められる文献

引用文献のカテゴリー＊	引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求項の番号
Ａ	尾上裕子，外６名，「マルチメディアストリーミング配信サーバにおけるネットワーク情報活用型レート制御方式」，情報処理学会論文誌，２００３年３月１５日，第４４巻，第３号，第６２５－６３６頁，ＩＳＳＮ：０３８７－５８０６，特に、第６２７頁左コラムの末尾２行の記載及び第６２７頁右コラム第１－８行の記載.	１－２６
Ａ	小山貴夫，外４名，「ＳＬＡで規定された同時到着を遵守するための複数マルチキャストを用いた伝送方式」，電子情報通信学会論文誌，２００４年７月１日，第Ｊ８７－Ｂ巻，第７号，第９２９－９３９頁，ＩＳＳＮ：１３４４－４６９７，特に、第９３０頁左コラムの末尾５行の記載.	１－２６

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2010/006067

A. CLASSIFICATION OF SUBJECT MATTER
H04N7/173(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04N7/173

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2010
Kokai Jitsuyo Shinan Koho	1971-2010	Toroku Jitsuyo Shinan Koho	1994-2010

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
CSDB(Japanese Patent Office), JSTPlus(JDream2)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Shigeyuki SAKAZAWA et al., "A Study on Dynamic Control of Coding Rate for TCP Video Streaming", IEICE Technical Report, 15 November 2002 (15.11.2002), vol.102, no.469, pages 19 to 24, ISSN:0913-5685, particularly, page 21, right column, line 2 to page 22, left column, line 7, page 22, left column, the last 11 lines	1-26
A	Yuko ONOE et al., "Network Information Based Rate.C, ntrols on Multimedia Streaming Servers", Transactions of Information Processing Society of Japan, 15 March 2003 (15.03.2003), vol.44, no.3, pages 625 to 636, ISSN:0387-5806, particularly, page 627, left column, the last 2 lines, page 627, right column, lines 1 to 8	1-26

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 October, 2010 (27.10.10)	09 November, 2010 (09.11.10)

Name and mailing address of the ISA/	Authorized officer
Japanese Patent Office	
Facsimile No.	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2010/006067

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Takao KOYAMA et al., "A Transmission Method Using Multicast Groups for Observing the Simultaneous Arrival Time Specified by SLA", The Transactions of the Institute of Electronics, Information and Communication Engineers, 01 July 2004 (01.07.2004), vol.J87-B, no.7, pages 929 to 939, ISSN:1344-4697, particularly, page 930, left column, the last 5 lines	1-26

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(12) 特許協力条約に基づいて公開された国際出願

(19) 世界知的所有権機関
国際事務局

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PCT

(10) 国際公開番号
WO 2011/055490 A1

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H04N 7/173 (2011.01)

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(30) 優先権データ:
特願 2009-253581 2009 年 11 月 5 日(05.11.2009) JP

(71) 出願人 (米国を除く全ての指定国について): 日本電気株式会社 (NEC Corporation) [JP/JP]; 〒1088001 東京都港区芝五丁目７番１号 Tokyo (JP).

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(74) 代理人: 馬場 資博, 外 (BABA, Motohiro et al.); 〒3500046 埼玉県川越市菅原町２５番地１ 石井ビル２階 Saitama (JP).

(81) 指定国 (表示のない限り、全ての種類の国内保護が可能): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

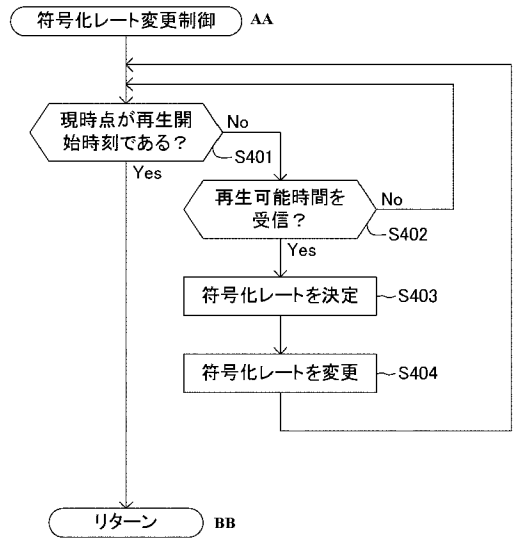
(84) 指定国 (表示のない限り、全ての種類の広域保護が可能): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), ユーラシア (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), ヨーロッパ (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

添付公開書類:
— 国際調査報告（条約第 21 条(3)）

(54) **Title**: DISTRIBUTION SYSTEM

(54) 発明の名称 : 配信システム

[図10]



AA ENCODING RATE CHANGE CONTROL
S401 IS CURRENT TIME REPRODUCTION START TIME?
S402 RECEIVE REPRODUCIBLE TIME?
S403 DETERMINE ENCODING RATE
S404 CHANGE ENCODING RATE
BB RETURN

(57) **Abstract**: A distribution system (100) includes a transmitting device (110) and a receiving device (120). The transmitting device transmits, to the receiving device, content data which has been encoded at a certain encoding rate. The receiving device stores the received data in a storage device and reproduces the contents based on the stored data, while receiving the content data transmitted from the transmitting device. The distribution system determines the encoding rate, based on a remaining period of time from the current time to a reproduction start time, and on a reproducible time, i.e., the time when the contents can be reproduced based on the stored data. The transmitting device changes the encoding rate of the content data to be transmitted to the determined encoding rate. The receiving device starts reproduction of the contents at the reproduction start time.

(57) 要約: 配信システム１００は、送信装置１１０及び受信装置１２０を含む。送信装置は、ある符号化レートにて符号化されたコンテンツデータを受信装置へ送信する。受信装置は、送信装置により送信されたコンテンツデータを受信しながら、受信されたデータを記憶装置に記憶させるとともに記憶されているデータに基づいてコンテンツを再生する。配信システムは、現時点から再生開始時刻までの残余時間と、記憶されているデータに基づいてコンテンツを再生可能な時間である再生可能時間と、に基づいて符号化レートを決定する。送信装置は、送信するコンテンツデータの符号化レートを、決定された符号化レートに変更する。受信装置は、再生開始時刻にてコンテンツの再生を開始する。

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明　細　書

発明の名称 ： 配信システム

技術分野

[0001] 本発明は、コンテンツを表すコンテンツデータを送信装置から受信装置へ送信する配信システムに関する。

背景技術

[0002] 互いに通信可能に構成された送信装置及び複数の受信装置を含み、複数の受信装置がコンテンツを同期して再生することが可能な配信システムが知られている。この種の配信システムの１つとして特許文献１に記載の配信システムは、複数の受信装置が備える時計の時刻を基準となる時計の時刻に一致させる。更に、送信装置は、受信装置がコンテンツの再生を開始する時刻である再生開始時刻を各受信端末へ送信する。

[0003] そして、送信装置は、コンテンツ（例えば、映像又は音声等）を表すコンテンツデータを各受信装置へ送信する。各受信装置は、コンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置（バッファ）に記憶させる。更に、各受信装置は、再生開始時刻になると、記憶されているデータに基づくコンテンツの再生を開始する。この結果、複数の受信装置間で、コンテンツの再生位置を一致させることができる。

[0004] また、特許文献２に記載の配信システムは、コンテンツの再生を開始する時刻が複数の受信装置間で異なる場合であっても、複数の受信装置がコンテンツを同期して再生することが可能なシステムである。この配信システムにおいて、第１の受信装置がコンテンツを再生している場合、第２の受信装置は、コンテンツの再生を開始するまでに要する時間を推定し、推定した時間に基づいて再生開始時刻を決定する。そして、第２の受信装置は、決定した再生開始時刻を送信装置へ送信する。

[0005] これにより、送信装置は、再生開始時刻以降において第１の受信装置へ送信する予定のコンテンツデータを第２の受信装置へ送信する。そして、第２

の受信装置は、再生開始時刻になると、記憶されているデータに基づくコンテンツの再生を開始する。この結果、第１の受信装置及び第２の受信装置の間で、コンテンツの再生位置を一致させることができる。

先行技術文献

特許文献

[0006] 特許文献1：特開２００５－１９１７８６号公報

特許文献2：特開２００７－１３７０５号公報

発明の概要

発明が解決しようとする課題

[0007] ところで、受信装置がコンテンツデータを受信している期間においても、受信装置が送信装置から単位時間あたりに受信するデータ量（通信速度）は、通信回線の利用状況等に応じて変動する。従って、通信速度が過度に低下した場合には、受信装置の記憶装置に記憶されているコンテンツデータのデータ量が、再生開始時刻までに十分な量に到達しない場合が生じる。このような場合、受信装置は、再生開始時刻にてコンテンツの再生を開始できない虞がある。

[0008] これに対処するため、受信装置の記憶装置に記憶されているコンテンツデータに基づいてコンテンツを再生可能な時間である再生可能時間に基づいて、送信されるコンテンツデータの符号化レートを変更するように配信システムを構成することが考えられる。

[0009] しかしながら、受信装置がコンテンツデータの受信を開始してから再生開始時刻までの期間において、再生可能時間は、０から徐々に増加していく。従って、再生可能時間のみに基づいて符号化レートを決定すると、受信装置がコンテンツデータの受信を開始した直後においては、符号化レートが過度に小さく設定され、一方、再生開始時刻の直前においては、符号化レートが過度に大きく設定される虞がある。

[0010] また、このような問題は、複数の受信装置がコンテンツを同期して再生す

る配信システムだけでなく、１つの受信装置が設定された再生開始時刻にてコンテンツの再生を開始する配信システムにも同様に生じる。

[0011] このため、本発明の目的は、上述した課題である「符号化レートが過度に大きく設定される場合、及び、受信装置が、設定された再生開始時刻にてコンテンツの再生を開始できない場合が生じること」を解決することが可能な配信システムを提供することにある。

課題を解決するための手段

[0012] かかる目的を達成するため本発明の一形態である配信システムは、互いに通信可能に構成された送信装置及び受信装置を含むシステムである。

更に、上記送信装置は、１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを上記受信装置へ送信するコンテンツ送信手段を備え、

上記受信装置は、上記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて上記コンテンツを再生するコンテンツ再生手段を備え、

上記配信システムは、

現時点から、上記受信装置が上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記受信装置の上記記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて、上記符号化レートを決定する符号化レート決定手段を備え、

上記コンテンツ送信手段は、上記受信装置へ送信するコンテンツデータの上記符号化レートを、上記決定された符号化レートに変更するように構成され、

上記コンテンツ再生手段は、上記設定された再生開始時刻にて、上記コンテンツの再生を開始するように構成される。

[0013] また、本発明の他の形態である配信方法は、

互いに通信可能に構成された送信装置及び受信装置を含む配信システムに適用され、

上記送信装置が、１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを上記受信装置へ送信し、

上記受信装置が、上記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて上記コンテンツを再生し、

現時点から、上記受信装置が上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記受信装置の上記記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて、上記符号化レートを決定し、

上記送信装置が上記受信装置へ送信するコンテンツデータの上記符号化レートを、上記決定された符号化レートに変更し、

上記受信装置は、上記設定された再生開始時刻にて、上記コンテンツの再生を開始する方法である。

[0014] また、本発明の他の形態である送信装置は、受信装置と通信可能に構成された装置である。

更に、この送信装置は、

１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを上記受信装置へ送信するコンテンツ送信手段を備え、

上記コンテンツ送信手段は、現時点から、上記受信装置が上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記受信装置の記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて決定された符号化レートに、上記受信装置へ送信する上記コンテンツデータの符号化

レートを変更するように構成される。

[0015] また、本発明の他の形態であるプログラムは、

受信装置と通信可能に構成された送信装置に、

１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを上記受信装置へ送信するコンテンツ送信手段を実現させるとともに、

上記コンテンツ送信手段は、現時点から、上記受信装置が上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記受信装置の記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて決定された符号化レートに、上記受信装置へ送信する上記コンテンツデータの符号化レートを変更するように構成される。

[0016] また、本発明の他の形態である受信装置は、送信装置と通信可能に構成された装置である。

更に、この受信装置は、

１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化され且つ上記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて上記コンテンツを再生するコンテンツ再生手段と、

現時点から、上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて、上記符号化レートを決定する符号化レート決定手段と、を備え、

上記コンテンツ再生手段は、上記決定された符号化レートにて符号化されたコンテンツデータを受信するように構成され、且つ、上記設定された再生開始時刻にて、上記コンテンツの再生を開始するように構成される。

[0017] また、本発明の他の形態であるプログラムは、

送信装置と通信可能に構成された受信装置に、

１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化され且つ上記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて上記コンテンツを再生するコンテンツ再生手段と、

現時点から、上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて、上記符号化レートを決定する符号化レート決定手段と、を実現させるとともに、

上記コンテンツ再生手段は、上記決定された符号化レートにて符号化されたコンテンツデータを受信するように構成され、且つ、上記設定された再生開始時刻にて、上記コンテンツの再生を開始するように構成される。

発明の効果

[0018] 本発明は、以上のように構成されることにより、符号化レートが無駄に小さくされることを防止しながら、受信装置が設定された再生開始時刻にてコンテンツの再生を確実に開始することができる。

図面の簡単な説明

[0019] [図1]本発明の第１実施形態に係る配信システムの概略構成を表す図である。

[図2]本発明の第１実施形態に係る配信システムの機能の概略を表すブロック図である。

[図3]本発明の第１実施形態に係る配信システムの作動を示したシーケンス図である。

[図4]本発明の第１実施形態に係るサーバ装置が実行する送信制御プログラムを示したフローチャートである。

[図5]本発明の第１実施形態に係るサーバ装置が記憶するセッション情報を示

したテーブルである。

[図6]本発明の第１実施形態に係る端末装置が実行する再生開始制御プログラムを示したフローチャートである。

[図7]本発明の第１実施形態に係るサーバ装置が記憶するセッション情報を示したテーブルである。

[図8]本発明の第１実施形態に係るサーバ装置が記憶するセッション情報を示したテーブルである。

[図9]本発明の第１実施形態に係るサーバ装置が記憶する履歴情報を示したテーブルである。

[図10]本発明の第１実施形態に係るサーバ装置が実行する符号化レート変更制御プログラムを示したフローチャートである。

[図11]本発明の第１実施形態に係るサーバ装置が記憶する履歴情報を示したテーブルである。

[図12]本発明の第１実施形態に係るサーバ装置が記憶する履歴情報を示したテーブルである。

[図13]本発明の第１実施形態に係る配信システムの作動を示したシーケンス図である。

[図14]本発明の第１実施形態に係るサーバ装置が記憶するセッション情報を示したテーブルである。

[図15]本発明の第１実施形態に係るサーバ装置が記憶するセッション情報を示したテーブルである。

[図16]本発明の第２実施形態に係る配信システムの機能の概略を表すブロック図である。

発明を実施するための形態

[0020] 以下、本発明に係る、配信システム、配信方法、送信装置、プログラム、及び、受信装置、の各実施形態について図１～図１６を参照しながら説明する。

[0021] ＜第１実施形態＞

図１に示したように、第１実施形態に係る配信システム１は、サーバ装置（送信装置）１０と、複数（本例では、３つ）の端末装置（受信装置）２０ａ，２０ｂ，２０ｃと、を含む。サーバ装置１０、及び、端末装置２０ａ～２０ｃは、通信回線（本例では、インターネット）ＮＷを介して、互いに通信可能に接続されている。

[0022] サーバ装置１０は、情報処理装置である。サーバ装置１０は、図示しない中央処理装置（ＣＰＵ；Ｃｅｎｔｒａｌ Ｐｒｏｃｅｓｓｉｎｇ Ｕｎｉｔ）、及び、記憶装置（メモリ及びハードディスク駆動装置（ＨＤＤ；Ｈａｒｄ Ｄｉｓｋ Ｄｒｉｖｅ））を備える。サーバ装置１０は、記憶装置に記憶されているプログラムをＣＰＵが実行することにより、後述する機能を実現するように構成されている。

[0023] 本例では、各端末装置２０ａ～２０ｃは、パーソナル・コンピュータである。なお、各端末装置２０ａ～２０ｃは、携帯電話端末、ＰＨＳ（Ｐｅｒｓｏｎａｌ Ｈａｎｄｙｐｈｏｎｅ Ｓｙｓｔｅｍ）、ＰＤＡ（Ｐｅｒｓｏｎａｌ Ｄａｔａ Ａｓｓｉｓｔａｎｃｅ、Ｐｅｒｓｏｎａｌ Ｄｉｇｉｔａｌ Ａｓｓｉｓｔａｎｔ）、カーナビゲーション端末、又は、ゲーム端末等であってもよい。

[0024] 各端末装置２０ａ～２０ｃは、ＣＰＵ、記憶装置、入力装置及び出力装置を備える。出力装置は、ディスプレイを有する。出力装置は、ＣＰＵから出力された画像情報に基づいて、文字及び図形等からなる画像をディスプレイに表示させる。入力装置は、キーボード及びマウスを有する。各端末装置２０ａ～２０ｃは、キーボード及びマウスを介して、ユーザの操作に基づく情報が入力されるように構成されている。

[0025] 各端末装置２０ａ～２０ｃは、記憶装置に記憶されているプログラムをＣＰＵが実行することにより、後述する機能を実現するように構成されている。

[0026] 図２は、上記のように構成された配信システム１の機能を表すブロック図である。ここでは、端末装置２０ａ～２０ｃのうちの端末装置２０ａの機能

について説明する。なお、端末装置２０ｂ及び端末装置２０ｃも、端末装置２０ａと同様の機能を有する。

[0027] また、配信システム１の機能は、端末装置２０ａのＣＰＵが後述する図６に示したフローチャートにより表されるプログラム等を実行するとともに、サーバ装置１０のＣＰＵが後述する図４及び図１０に示したフローチャートにより表されるプログラム等を実行することにより、実現される。

[0028] 端末装置２０ａの機能は、要求送信部３１と、同期再生制御部（同期再生制御手段）３２と、コンテンツ再生部（コンテンツ再生手段）３３と、再生可能時間送信部３４と、を含む。

[0029] また、サーバ装置１０の機能は、要求受信部４１と、セッション情報記憶部４２と、再生開始時刻設定部（再生開始時刻設定手段）４３と、コンテンツデータ記憶部４４と、コンテンツ送信部（コンテンツ送信手段）４５と、再生可能時間受信部４６と、符号化レート決定部（符号化レート決定手段）４７と、を含む。

[0030] 端末装置２０ａの要求送信部３１は、ユーザにより入力装置を介して入力されたセッション開始指示を受け付ける。セッション開始指示は、セッションを開始する旨を指示する情報である。セッション開始指示は、コンテンツを識別するためのコンテンツ識別情報（コンテンツＩＤ）と、コンテンツを同期させて再生する他の端末装置を識別するための端末識別情報（端末ＩＤ）である他端末ＩＤと、を含む。

[0031] 要求送信部３１は、セッション開始指示を受け付けた場合、セッション開始指示に含まれるコンテンツＩＤと、自装置（端末装置２０ａ）を識別するための端末識別情報（端末ＩＤ）である自端末ＩＤ及びセッション開始指示に含まれる他端末ＩＤからなる端末ＩＤと、を含むセッション開始要求をサーバ装置１０へ送信する。セッション開始要求は、セッションを開始する旨を要求する情報である。

[0032] サーバ装置１０の要求受信部４１は、端末装置２０ａからセッション開始要求を受信する。要求受信部４１は、セッション開始要求を受信した場合、

セッションを識別するためのセッション識別情報（セッションＩＤ）を生成する。更に、要求受信部４１は、生成したセッションＩＤと、セッション開始要求に含まれる、コンテンツＩＤ及び端末ＩＤと、を含むセッション情報をセッション情報記憶部４２に記憶させる。

[0033] 加えて、要求受信部４１は、生成したセッションＩＤを、セッション開始要求に含まれる端末ＩＤにより識別される端末装置２０ａ～２０ｃのそれぞれへ送信する。

[0034] 端末装置２０ａの要求送信部３１は、サーバ装置１０からセッションＩＤを受信する。更に、要求送信部３１は、ユーザにより入力装置を介して入力されたセッション参加指示を受け付ける。セッション参加指示は、セッションへ参加する旨を指示する情報である。

[0035] 要求送信部３１は、セッション参加指示を受け付けた場合、受信したセッションＩＤと、自装置（端末装置２０ａ）を識別するための端末識別情報（端末ＩＤ）である自端末ＩＤと、起動時間と、通信速度と、を含むセッション参加要求をサーバ装置１０へ送信する。セッション参加要求は、セッションへ参加する旨を要求する情報である。

[0036] 起動時間は、端末装置２０ａがコンテンツを再生するために実行するアプリケーションプログラムが起動するために要する時間である。また、通信速度は、サーバ装置１０から端末装置２０ａへ単位時間あたりに送信されるデータのデータ量である。本例では、起動時間及び通信速度は、ユーザにより入力された値である。なお、端末装置２０ａは、起動時間及び通信速度を計測し、計測された起動時間及び通信速度を含むセッション参加要求を送信するように構成されていてもよい。

[0037] サーバ装置１０の要求受信部４１は、各端末装置２０ａ～２０ｃからセッション参加要求を受信する。要求受信部４１は、セッション参加要求を受信した場合、セッション情報記憶部４２に記憶されているセッション情報のうちの、セッション参加要求に含まれるセッションＩＤ及び端末ＩＤを含むセッション情報に、セッション参加要求に含まれる起動時間及び通信速度を追

加する。

[0038] サーバ装置１０のコンテンツデータ記憶部４４は、複数のコンテンツデータを予め記憶（蓄積）している。各コンテンツデータは、複数のコンテンツ（例えば、映像及び／又は音声等を表す情報）の１つを表すデータである。コンテンツデータ記憶部４４は、各コンテンツを表すコンテンツデータとして、複数の異なる符号化レートのそれぞれにて当該コンテンツが符号化された複数のコンテンツデータを記憶している。符号化レートは、コンテンツを単位時間（例えば、１秒）だけ等速再生（１倍速にて再生）するためのコンテンツデータのデータ量（データサイズ、例えば、バイト数）を表す。

[0039] サーバ装置１０の再生開始時刻設定部４３は、再生開始時刻決定部４３ａと、再生開始時刻送信部４３ｂと、を含む。

[0040] 再生開始時刻決定部４３ａは、セッション開始要求が受信されてから、予め設定された待機時間が経過するまでの間に受信されたセッション参加要求に基づいて、再生開始時刻を決定する。再生開始時刻は、セッション参加要求を送信してきた端末装置がコンテンツの再生を開始する時刻である。

[0041] 具体的には、再生開始時刻決定部４３ａは、セッション開始要求が受信されてから上記待機時間が経過した時点にて、セッション情報記憶部４２に記憶されているセッション情報のうちの、当該セッション開始要求に対して生成したセッションＩＤを含むセッション情報を取得する。

[0042] 再生開始時刻決定部４３ａは、取得されたセッション情報のそれぞれ（即ち、端末装置のそれぞれ）に対して、装置毎再生準備時間T_pを算出する。装置毎再生準備時間T_pは、端末装置がコンテンツの再生を開始するために要する時間である。

[0043] 本例では、再生開始時刻決定部４３ａは、コンテンツデータ記憶部４４に記憶されているコンテンツデータのうちの、取得されたセッション情報に含まれるコンテンツＩＤにより識別されるコンテンツを表すコンテンツデータを抽出する。そして、再生開始時刻決定部４３ａは、抽出されたコンテンツデータが有する符号化レートのうちの、取得されたセッション情報に含まれ

る通信速度以下であり且つ当該通信速度に最も近い値を有する符号化レートｒを特定する。

[0044] そして、再生開始時刻決定部４３ａは、特定した符号化レートｒと、取得されたセッション情報に含まれる通信速度Ｂと、予め設定された目標再生可能時間T_dと、下記式（１）と、に基づいて、再生準備通信時間T_cを算出する。

$$T_c = r \cdot T_d / B \quad \cdots (1)$$

[0045] 目標再生可能時間T_dは、再生可能時間の目標値である。なお、目標再生可能時間は、端末装置毎に設定されていてもよい。また、目標再生可能時間は、端末装置から受信された値であってもよい。再生可能時間は、端末装置の記憶装置（後述するバッファ部３３ｂ）に記憶されているコンテンツデータに基づいて端末装置がコンテンツを再生可能な時間である。再生準備通信時間T_cは、端末装置がコンテンツデータの受信を開始してから、再生可能時間が目標再生可能時間T_dに一致するまでに要する時間である。

[0046] 更に、再生開始時刻決定部４３ａは、取得されたセッション情報に含まれる起動時間T_aと、上記算出した再生準備通信時間T_cと、を加えることにより、下記式（２）のように、装置毎再生準備時間T_pを算出する。

$$T_p = T_a + T_c \quad \cdots (2)$$

[0047] 加えて、再生開始時刻決定部４３ａは、算出された装置毎再生準備時間T_pの最大値T_{pmax}を現時点の時刻ｔに加えることにより、下記式（３）のように、再生開始時刻T_sを決定する。

$$T_s = t + T_{pmax} \quad \cdots (3)$$

[0048] また、再生開始時刻決定部４３ａは、セッション開始要求が受信されてから、上記待機時間が経過した後にセッション参加要求を受信した場合、上述した場合と同様に、そのセッション参加要求を送信してきた端末装置に対する再生開始時刻T_sを決定する。

[0049] 再生開始時刻決定部４３ａは、再生開始時刻を決定した場合、再生開始時刻を決定する基となったセッション参加要求に含まれるセッションＩＤ及び

端末ＩＤを含むセッション情報に、決定した再生開始時刻を追加する。

[0050] 再生開始時刻送信部４３ｂは、再生開始時刻決定部４３ａにより決定された再生開始時刻を、セッション参加要求を送信してきた端末装置のそれぞれへ送信する。

このように、再生開始時刻設定部４３は、目標再生可能時間と、起動時間と、通信速度と、に基づいて再生開始時刻を設定する。

[0051] 端末装置２０ａの同期再生制御部３２は、再生開始時刻受信部３２ａを含む。再生開始時刻受信部３２ａは、サーバ装置１０から送信された再生開始時刻を受信する。同期再生制御部３２は、再生開始時刻受信部３２ａにより受信された再生開始時刻を記憶装置に記憶させる。同期再生制御部３２は、予め設定された制御周期が経過する毎に、現時点の時刻が記憶されている再生開始時刻に到達した（現時点が再生開始時刻となった）か否かを判定する。

[0052] 同期再生制御部３２は、現時点の時刻が記憶されている再生開始時刻に到達した場合、再生開始指示をコンテンツ再生部３３へ出力する。再生開始指示は、コンテンツの再生を開始する旨を指示する情報である。このようにして、同期再生制御部３２は、複数の端末装置２０ａ～２０ｃのそれぞれが再生するコンテンツの再生位置を複数の端末装置２０ａ～２０ｃ間で一致させる。

[0053] サーバ装置１０のコンテンツ送信部４５は、コンテンツデータ記憶部４４に記憶されているコンテンツデータを端末装置２０ａ～２０ｃへ送信する。即ち、コンテンツ送信部４５は、１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを端末装置２０ａ～２０ｃへ送信する。

[0054] 具体的には、コンテンツ送信部４５は、再生開始時刻設定部４３により再生開始時刻が決定された場合、再生開始時刻を決定する基となったセッション参加要求を送信してきた端末装置へ、コンテンツデータ記憶部４４に記憶されているコンテンツデータを送信する。

[0055] このとき、コンテンツ送信部４５は、セッション参加要求に含まれるセッションＩＤを含むセッション情報に含まれるコンテンツＩＤにより識別されるコンテンツデータであって、当該セッション参加要求を送信してきた端末装置に対して再生開始時刻決定部４３ａにより特定された符号化レートにて符号化されたコンテンツデータを送信する。

[0056] コンテンツ送信部４５は、セッション開始要求が受信されてから、上記待機時間が経過するまでの間に受信されたセッション参加要求に基づいてコンテンツデータを送信する場合、先頭位置からコンテンツデータの送信を開始する。

[0057] 一方、コンテンツ送信部４５は、セッション開始要求が受信されてから、上記待機時間が経過した後に受信されたセッション参加要求に基づいてコンテンツデータを送信する場合、判定条件が成立しているか否かを判定する。ここで、判定条件は、上記セッション参加要求に基づいて再生開始時刻設定部４３により決定された再生開始時刻（第２の再生開始時刻）が、当該セッション参加要求と同一のセッションＩＤを含む他のセッション参加要求に基づいて再生開始時刻設定部４３により決定された再生開始時刻（第１の再生開始時刻）よりも後の時刻であるという条件である。

[0058] コンテンツ送信部４５は、第２の再生開始時刻が第１の再生開始時刻以前の時刻である場合、先頭位置からコンテンツデータの送信を開始する。

[0059] 一方、コンテンツ送信部４５は、第２の再生開始時刻が第１の再生開始時刻よりも後の時刻である場合、先頭位置から、第１の再生開始時刻と第２の再生開始時刻との差だけ後の位置を送信開始位置として決定する。送信開始位置は、コンテンツデータ内の位置であって、当該コンテンツデータの送信を開始する位置である。そして、コンテンツ送信部４５は、決定した送信開始位置からコンテンツデータの送信を開始する。

[0060] 即ち、コンテンツ送信部４５は、第１の端末装置に対して設定された再生開始時刻（第１の再生開始時刻）よりも、第２の端末装置に対して設定された再生開始時刻（第２の再生開始時刻）が後の時刻である場合、当該第２の

再生開始時刻にて当該第１の端末装置が再生しているコンテンツの再生位置（即ち、送信開始位置）を推定する。そして、コンテンツ送信部４５は、コンテンツデータのうちの、当該推定された再生位置以降の部分を当該第２の端末装置へ送信する。

[0061] 端末装置２０ａのコンテンツ再生部３３は、コンテンツ受信部３３ａと、バッファ部３３ｂと、コンテンツ再生実行部３３ｃと、を含む。

コンテンツ受信部３３ａは、サーバ装置１０により送信されたコンテンツデータを受信する。バッファ部３３ｂは、コンテンツ受信部３３ａにより受信されたデータを記憶する。コンテンツ再生実行部３３ｃは、バッファ部３３ｂに記憶されているデータに基づいてコンテンツを再生する。

[0062] 即ち、コンテンツ再生部３３は、サーバ装置１０により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいてコンテンツを再生する（ストリーミング方式により再生を行う）。

[0063] なお、コンテンツ再生実行部３３ｃは、同期再生制御部３２により出力された再生開始指示を受け付けた場合に（即ち、設定された再生開始時刻にて）、コンテンツの再生を開始する。

[0064] 端末装置２０ａの再生可能時間送信部３４は、バッファ部３３ｂに記憶されているコンテンツデータに基づいてコンテンツ再生実行部３３ｃがコンテンツを再生可能な時間である再生可能時間を、予め設定された取得周期（変更周期）が経過する毎に、取得する。再生可能時間送信部３４は、再生可能時間が取得された場合、取得された再生可能時間と、自端末ＩＤ（端末ＩＤ）と、セッションＩＤと、を含む再生可能時間情報をサーバ装置１０へ送信する。

[0065] サーバ装置１０の再生可能時間受信部４６は、各端末装置２０ａ～２０ｃから再生可能時間情報を受信する。

サーバ装置１０の符号化レート決定部４７は、再生可能時間受信部４６により再生可能時間情報が受信された場合、再生可能時間情報に含まれる端末

ＩＤ及びセッションＩＤを含むセッション情報に含まれる再生開始時刻を取得する。

[0066] 符号化レート決定部４７は、現時点から、取得（即ち、設定）された再生開始時刻までの残余時間と、再生可能時間情報に含まれる再生可能時間と、に基づいて、当該再生可能時間情報を送信してきた端末装置に対して符号化レートを決定する。

[0067] 具体的には、符号化レート決定部４７は、再生可能時間が目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を符号化レートとして決定する。

[0068] 本例では、符号化レート決定部４７は、下記式（４）に基づいて、現時点から上記変更周期だけ前（過去）の時点までの期間における通信速度B_nを算出（取得）する。ここで、ｎは整数であり、当該端末装置から再生可能時間情報を受信した回数を表す。

$$B_n = (T_n - T_{n-1}) \cdot r_n / (t_n - t_{n-1}) \quad \cdots (4)$$

[0069] ここで、t_nは、今回、再生可能時間情報を受信した（即ち、現時点の）時刻であり、t_{n-1}は、前回、再生可能時間情報を受信した（即ち、変更周期だけ前の時点の）時刻である。また、T_nは、今回受信した（即ち、現時点の）再生可能時間であり、T_{n-1}は、前回受信した（即ち、変更周期だけ前の時点の）再生可能時間である。また、r_nは、時刻t_{n-1}から時刻t_nまでの間に送信されたコンテンツデータが有する符号化レートである。

[0070] 本例では、現時点から再生開始時刻までの間、通信速度が上記通信速度B_nに維持されることを仮定して、次回、再生可能時間情報を受信する（即ち、変更周期だけ後の時点の）時刻までの間に送信されるコンテンツデータが有する符号化レートr_{n+1}を決定する。即ち、符号化レート決定部４７は、下記式（５）に基づいて、符号化レートr_{n+1}を決定する。

$$r_{n+1} = B_n \cdot (t_s - t_n) / (T_d - T_n) \quad \cdots (5)$$

[0071] 即ち、符号化レート決定部４７は、取得された通信速度B_nに残余時間$t_s - t_n$を乗じた値を、目標再生可能時間T_dから再生可能時間T_nを減じた値Ｔ

$_{d}$－Ｔ$_{n}$により除した値を符号化レートｒ$_{n+1}$として決定する。

[0072] コンテンツ送信部４５は、符号化レート決定部４７により符号化レートｒ$_{n+1}$が決定された場合、その符号化レートｒ$_{n+1}$を決定する基となった再生可能時間情報を送信してきた端末装置へ送信するコンテンツデータを、当該符号化レートｒ$_{n+1}$により符号化されたコンテンツデータに変更する。即ち、コンテンツ送信部４５は、再生可能時間情報を送信してきた端末装置へ送信するコンテンツデータの符号化レートを、再生可能時間情報に基づいて決定された符号化レートに変更する。

[0073] なお、コンテンツ送信部４５は、符号化レート決定部４７により決定された符号化レートｒ$_{n+1}$を有するコンテンツデータがコンテンツデータ記憶部４４に記憶されていない場合、コンテンツデータ記憶部４４に記憶されているコンテンツデータのうちの、当該符号化レートｒ$_{n+1}$以下であり且つ当該符号化レートｒ$_{n+1}$に最も近い符号化レートを有するコンテンツデータを送信する。

[0074] 次に、上述した配信システム１の作動について説明する。なお、本例では、サーバ装置１０は、各コンテンツに対して、２Ｍｂｐｓ、４Ｍｂｐｓ、１６Ｍｂｐｓ、及び、５０Ｍｂｐｓのそれぞれにて符号化されたコンテンツデータを記憶装置に予め記憶させている。また、目標再生可能時間Ｔ$_{d}$は、３０秒に設定されている。

[0075] 図３に示したように、端末装置２０ａは、コンテンツＩＤとしての「Ｃ０１」と、他端末ＩＤとしての「Ｒ０２」及び「Ｒ０３」と、を含むセッション開始指示を受け付ける。本例では、「Ｒ０１」は、端末装置２０ａを識別するための端末ＩＤであり、「Ｒ０２」は、端末装置２０ｂを識別するための端末ＩＤであり、「Ｒ０３」は、端末装置２０ｃを識別するための端末ＩＤである。

[0076] 端末装置２０ａは、セッション開始指示を受け付けると、コンテンツＩＤとしての「Ｃ０１」と、端末ＩＤとしての「Ｒ０１」、「Ｒ０２」及び「Ｒ０３」と、を含むセッション開始要求をサーバ装置１０へ送信する（ステッ

プＳ１０１）。

[0077] サーバ装置１０は、端末装置２０ａからセッション開始要求を受信すると、図４にフローチャートにより示した送信制御プログラムを実行する。サーバ装置１０は、セッションを識別するためのセッションＩＤとして「Ｓ０１」を生成する。更に、サーバ装置１０は、生成したセッションＩＤ「Ｓ０１」と、セッション開始要求に含まれる、コンテンツＩＤ「Ｃ０１」及び端末ＩＤ（「Ｒ０１」、「Ｒ０２」及び「Ｒ０３」）のそれぞれと、を含むセッション情報を、図５に示したように、記憶装置に記憶させる。

[0078] 加えて、サーバ装置１０は、生成したセッションＩＤを、セッション開始要求に含まれる端末ＩＤにより識別される端末装置２０ａ～２０ｃのそれぞれへ送信する（図４のステップＳ２０１、図３のステップＳ１０２）。その後、サーバ装置１０は、上記待機時間（本例では、３秒）だけ待機する（図４のステップＳ２０２）。

[0079] 次いで、端末装置２０ａのユーザがセッション参加指示を入力すると、端末装置２０ａは、図６にフローチャートにより示した再生開始制御プログラムを実行する。端末装置２０ａは、受信したセッションＩＤ「Ｓ０１」と、端末ＩＤ「Ｒ０１」と、起動時間「１２００」（ｍｓ）と、通信速度「３」（Ｍｂｐｓ）と、を含むセッション参加要求をサーバ装置１０へ送信する（図６のステップＳ３０１、図３のステップＳ１０３）。

[0080] 本例では、端末装置２０ｂも、端末装置２０ａと同様に、セッションＩＤ「Ｓ０１」と、端末ＩＤ「Ｒ０２」と、起動時間「１０００」（ｍｓ）と、通信速度「５０」（Ｍｂｐｓ）と、を含むセッション参加要求をサーバ装置１０へ送信する（図３のステップＳ１０４）。

[0081] サーバ装置１０は、各端末装置２０ａ，２０ｂからセッション参加要求を受信すると、図７に示したように、記憶装置に記憶されているセッション情報のうちの、セッション参加要求に含まれるセッションＩＤ及び端末ＩＤを含むセッション情報に、セッション参加要求に含まれる起動時間及び通信速度を追加する。

[0082] そして、待機時間が経過すると、サーバ装置１０は、セッション参加要求を送信してきた端末装置２０ａ，２０ｂのそれぞれに対して、記憶装置に記憶されているコンテンツデータが有する符号化レートのうちの、通信速度以下であり且つ通信速度に最も近い符号化レートｒを特定する。本例では、サーバ装置１０は、端末装置２０ａに対する符号化レートｒとして「２Ｍｂｐｓ」を特定し、端末装置２０ｂに対する符号化レートｒとして「５０Ｍｂｐｓ」を特定する。

[0083] 次いで、サーバ装置１０は、セッション参加要求を送信してきた端末装置２０ａ，２０ｂのそれぞれに対して、記憶されているセッション情報に含まれる通信速度Ｂ及び起動時間T_aと、予め設定された目標再生可能時間T_dと、に基づいて装置毎再生準備時間T_pを算出する（図４のステップ２０３）。

[0084] 本例では、サーバ装置１０は、上記式（１）～（３）に基づいて、端末装置２０ａに対する装置毎再生準備時間T_pとして「２１．２」を算出し、端末装置２０ｂに対する装置毎再生準備時間T_pとして「３１」を算出する。

[0085] 次いで、サーバ装置１０は、算出した装置毎再生準備時間T_pの最大値T_{pmax}（ここでは、「３１」）に基づいて再生開始時刻T_s（「１３：０１：３４」）を決定する（図４のステップＳ２０４）。そして、サーバ装置１０は、図８に示したように、セッションＩＤ「Ｓ０１」及び端末ＩＤ「Ｒ０１」を含むセッション情報、並びに、セッションＩＤ「Ｓ０１」及び端末ＩＤ「Ｒ０２」を含むセッション情報、のそれぞれに、決定した再生開始時刻を追加する。

[0086] 次いで、サーバ装置１０は、セッション参加要求を送信してきた端末装置２０ａ，２０ｂのそれぞれへ、決定した再生開始時刻T_sを送信する（図４のステップＳ２０５、図３のステップＳ１０５）。

[0087] これにより、端末装置２０ａは、サーバ装置１０から再生開始時刻T_sを受信する（図６のステップＳ３０２）。なお、端末装置２０ｂも、以降において、端末装置２０ａと同様に作動する。

[0088] そして、サーバ装置１０は、決定した再生開始時刻T_sが、受信したセッシ

ョン参加要求と同一のセッションＩＤを含む他のセッション参加要求に基づいて決定された再生開始時刻よりも後の時刻であるか否かを判定する（図４のステップＳ２０６）。

[0089] この時点では、サーバ装置１０は、受信したセッション参加要求と同一のセッションＩＤを含む他のセッション参加要求を受信していない。従って、サーバ装置１０は、「Ｎｏ」と判定してステップＳ２０８へ進み、セッション参加要求を送信してきた端末装置２０ａ，２０ｂのそれぞれへのコンテンツデータの送信を、当該コンテンツデータの先頭位置から開始する（図４のステップＳ２０８、図３のステップＳ１０６）。

[0090] このとき、サーバ装置１０が端末装置２０ａへ送信するコンテンツデータは、セッションＩＤ「Ｓ０１」を含むセッション情報に含まれるコンテンツＩＤ「Ｃ０１」により識別されるコンテンツを表すコンテンツデータである。更に、このコンテンツデータは、端末装置２０ａから受信したセッション参加要求に含まれる通信速度に基づいて特定された符号化レートにて符号化されたデータである。

[0091] 同様に、サーバ装置１０が端末装置２０ｂへ送信するコンテンツデータは、セッションＩＤ「Ｓ０１」を含むセッション情報に含まれるコンテンツＩＤ「Ｃ０１」により識別されるコンテンツを表すコンテンツデータである。更に、このコンテンツデータは、端末装置２０ｂから受信したセッション参加要求に含まれる通信速度に基づいて特定された符号化レートにて符号化されたデータである。

[0092] また、サーバ装置１０は、図９に示したように、セッション参加要求に含まれるセッションＩＤ及び端末ＩＤと、再生可能時間の初期値としての「０」と、再生開始時刻と現時点の時刻との差「３１」と、を対応付けた履歴情報を記憶装置に記憶させる。

[0093] 一方、端末装置２０ａは、サーバ装置１０により送信されたコンテンツデータの受信を開始する（図６のステップＳ３０３）。次いで、端末装置２０ａは、現時点の時刻が再生開始時刻T_sに到達したか否かを判定する（図６の

ステップＳ３０４）。この時点では、現時点の時刻は、再生開始時刻Ｔ$_s$に到達していない。

[0094] 従って、端末装置２０ａは、「Ｎｏ」と判定してステップＳ３０５へ進み、コンテンツデータの受信が開始してから送信周期（本例では、５秒）が経過したか否かを判定する（図６のステップＳ３０５）。この時点では、コンテンツデータの受信が開始してから送信周期は経過していない。

[0095] 従って、端末装置２０ａは、「Ｎｏ」と判定してステップＳ３０４へ戻り、コンテンツデータの受信が開始してから送信周期が経過するまで、上記処理を繰り返し実行する。

[0096] そして、コンテンツデータの受信が開始してから送信周期が経過すると、端末装置２０ａは、ステップＳ３０５にて「Ｙｅｓ」と判定してステップＳ３０６へ進み、再生可能時間を取得する。いま、取得された再生可能時間が「７」秒である場合を想定する。

[0097] そして、端末装置２０ａは、取得した再生可能時間「７」と、端末ＩＤ「Ｒ０１」と、セッションＩＤ「Ｓ０１」と、を含む再生可能時間情報をサーバ装置１０へ送信する（図３のステップＳ１０７）。同様に、端末装置２０ｂは、再生可能時間「２」と、端末ＩＤ「Ｒ０２」と、セッションＩＤ「Ｓ０１」と、を含む再生可能時間情報をサーバ装置１０へ送信する（図３のステップＳ１０８）。

[0098] 一方、サーバ装置１０は、図４のステップＳ２０９へ進み、各端末装置に対する符号化レート変更制御を行うため、図１０にフローチャートにより示した符号化レート変更制御プログラムを、コンテンツデータを送信している各端末装置２０ａ，２０ｂに対して独立に実行する。

[0099] 先ず、サーバ装置１０が端末装置２０ａに対して実行する符号化レート変更制御について説明する。

[0100] サーバ装置１０は、現時点の時刻が再生開始時刻Ｔ$_s$に到達したか否かを判定する（図１０のステップＳ４０１）。この時点では、現時点の時刻は、再生開始時刻Ｔ$_s$に到達していない。

[0101] 従って、サーバ装置１０は、「Ｎｏ」と判定してステップＳ４０２へ進み、端末装置２０ａから再生可能時間情報を受信したか否かを判定する。サーバ装置１０は、端末装置２０ａから再生可能時間情報を受信していない場合、ステップＳ４０１へ戻り、上記処理を繰り返し実行する。

[0102] いま、サーバ装置１０は、端末装置２０ａから再生可能時間情報を受信している。従って、サーバ装置１０は、「Ｙｅｓ」と判定してステップＳ４０３へ進み、図１１に示したように、再生可能時間情報に含まれるセッションＩＤ「Ｓ０１」、端末ＩＤ「Ｒ０１」及び再生可能時間「７」と、再生開始時刻と現時点の時刻との差「２６」と、を対応付けた履歴情報を記憶装置に記憶させる。

[0103] サーバ装置１０は、記憶装置に記憶されている履歴情報に基づいて符号化レートを決定する。本例では、サーバ装置１０は、上記式（４）に基づいて、通信速度B_nとして「２．８Ｍｂｐｓ」を算出する。更に、サーバ装置１０は、上記式（５）に基づいて、符号化レートr_{n+1}として「３．１６５Ｍｂｐｓ」を算出（決定）する（図１０のステップＳ４０３）。

[0104] そして、サーバ装置１０は、記憶装置に記憶されているコンテンツデータの符号化レートのうちの、当該符号化レートr_{n+1}以下であり且つ当該符号化レートr_{n+1}に最も近い符号化レートとして「２Ｍｂｐｓ」を特定する。次いで、サーバ装置１０は、端末装置２０ａへ送信しているコンテンツデータの符号化レートを、上記特定された符号化レート「２Ｍｂｐｓ」に変更する（図１０のステップＳ４０４）。その後、サーバ装置１０は、ステップＳ４０１へ戻り、上述した処理を繰り返し実行する。

[0105] 次に、サーバ装置１０が端末装置２０ｂに対して実行する符号化レート変更制御について説明する。

[0106] サーバ装置１０は、端末装置２０ｂから再生可能時間情報を受信すると、図１０のステップＳ４０３へ進み、図１１に示したように、再生可能時間情報に含まれるセッションＩＤ「Ｓ０１」、端末ＩＤ「Ｒ０２」及び再生可能時間「２」と、再生開始時刻と現時点の時刻との差「２６」と、を対応付け

た履歴情報を記憶装置に記憶させる。

[0107] サーバ装置１０は、記憶装置に記憶されている履歴情報に基づいて符号化レートを決定する。本例では、サーバ装置１０は、上記式（４）に基づいて、通信速度B_nとして「２０Ｍｂｐｓ」を算出する。更に、サーバ装置１０は、上記式（５）に基づいて、符号化レートr_{n+1}として「１８．５７Ｍｂｐｓ」を算出（決定）する（図１０のステップＳ４０３）。

[0108] そして、サーバ装置１０は、記憶装置に記憶されているコンテンツデータの符号化レートのうちの、当該符号化レートr_{n+1}以下であり且つ当該符号化レートr_{n+1}に最も近い符号化レートとして「１６Ｍｂｐｓ」を特定する。次いで、サーバ装置１０は、端末装置２０ｂへ送信しているコンテンツデータの符号化レートを、上記特定された符号化レート「１６Ｍｂｐｓ」に変更する（図１０のステップＳ４０４）。その後、サーバ装置１０は、ステップＳ４０１へ戻り、上述した処理を繰り返し実行する。

[0109] そして、端末装置２０ａ及び端末装置２０ｂが再生可能時間情報を送信してから再び送信周期が経過すると、端末装置２０ａ及び端末装置２０ｂのそれぞれは、再び、図６のステップＳ３０５にて「Ｙｅｓ」と判定してステップＳ３０６へ進み、再生可能時間情報をサーバ装置１０へ送信する。

[0110] いま、端末装置２０ａが、再生可能時間「１８」と、端末ＩＤ「Ｒ０１」と、セッションＩＤ「Ｓ０１」と、を含む再生可能時間情報をサーバ装置１０へ送信する場合であって、端末装置２０ｂが、再生可能時間「１４」と、端末ＩＤ「Ｒ０２」と、セッションＩＤ「Ｓ０１」と、を含む再生可能時間情報をサーバ装置１０へ送信する場合を想定する。

[0111] 先ず、サーバ装置１０が端末装置２０ａに対して実行する符号化レート変更制御について説明する。

[0112] サーバ装置１０は、図１０のステップＳ４０２にて「Ｙｅｓ」と判定してステップＳ４０３へ進み、図１２に示したように、再生可能時間情報に含まれるセッションＩＤ「Ｓ０１」、端末ＩＤ「Ｒ０１」及び再生可能時間「１８」と、再生開始時刻と現時点の時刻との差「２１」と、を対応付けた履歴

情報を記憶装置に記憶させる。

[0113] サーバ装置１０は、記憶装置に記憶されている履歴情報に基づいて符号化レートを決定する。本例では、サーバ装置１０は、上記式（４）に基づいて、通信速度B_nとして「４．４Ｍｂｐｓ」を算出する。更に、サーバ装置１０は、上記式（５）に基づいて、符号化レートr_{n+1}として「７．７Ｍｂｐｓ」を算出（決定）する（図１０のステップＳ４０３）。

[0114] そして、サーバ装置１０は、記憶装置に記憶されているコンテンツデータの符号化レートのうちの、当該符号化レートr_{n+1}以下であり且つ当該符号化レートr_{n+1}に最も近い符号化レートとして「４Ｍｂｐｓ」を特定する。次いで、サーバ装置１０は、端末装置２０ａへ送信しているコンテンツデータの符号化レートを、上記特定された符号化レート「４Ｍｂｐｓ」に変更する（図１０のステップＳ４０４）。その後、サーバ装置１０は、ステップＳ４０１へ戻り、上述した処理を繰り返し実行する。

[0115] 次に、サーバ装置１０が端末装置２０ｂに対して実行する符号化レート変更制御について説明する。

[0116] サーバ装置１０は、図１０のステップＳ４０２にて「Ｙｅｓ」と判定してステップＳ４０３へ進み、図１２に示したように、再生可能時間情報に含まれるセッションＩＤ「Ｓ０１」、端末ＩＤ「Ｒ０２」及び再生可能時間「１４」と、再生開始時刻と現時点の時刻との差「２１」と、を対応付けた履歴情報を記憶装置に記憶させる。

[0117] サーバ装置１０は、記憶装置に記憶されている履歴情報に基づいて符号化レートを決定する。本例では、サーバ装置１０は、上記式（４）に基づいて、通信速度B_nとして「３８．４Ｍｂｐｓ」を算出する。更に、サーバ装置１０は、上記式（５）に基づいて、符号化レートr_{n+1}として「５０．４Ｍｂｐｓ」を算出（決定）する（図１０のステップＳ４０３）。

[0118] そして、サーバ装置１０は、記憶装置に記憶されているコンテンツデータの符号化レートのうちの、当該符号化レートr_{n+1}以下であり且つ当該符号化レートr_{n+1}に最も近い符号化レートとして「５０Ｍｂｐｓ」を特定する。次

いで、サーバ装置１０は、端末装置２０ｂへ送信しているコンテンツデータの符号化レートを、上記特定された符号化レート「５０Ｍｂｐｓ」に変更する（図１０のステップＳ４０４）。その後、サーバ装置１０は、ステップＳ４０１へ戻り、上述した処理を繰り返し実行する。

[0119] その後、送信周期（変更周期）が経過する毎に、サーバ装置１０は、コンテンツデータを送信している端末装置２０ａ，２０ｂのそれぞれに対して符号化レートを決定し、送信しているコンテンツデータの符号化レートを、決定した符号化レートに変更する。

[0120] その後、現時点の時刻が再生開始時刻T_sに到達すると、端末装置２０ａ及び端末装置２０ｂのそれぞれは、図６のステップＳ３０４にて「Ｙｅｓ」と判定してステップＳ３０７へ進み、記憶装置に記憶されているコンテンツデータに基づいてコンテンツの再生（出力装置への出力）を開始する（図３のステップＳ１１０ａ，Ｓ１１０ｂ）。

[0121] これにより、複数の端末装置２０ａ，２０ｂ間で、コンテンツの再生位置を確実に一致させることができる。即ち、複数の端末装置２０ａ，２０ｂ間で、同一のコンテンツを同期して再生することができる。

[0122] また、この時点にて、サーバ装置１０は、図１０のステップＳ４０１にて「Ｙｅｓ」と判定して、符号化レート変更制御プログラムの実行を終了する。

[0123] これによれば、配信システム１は、残余時間及び再生可能時間の両方に基づいて、サーバ装置１０から端末装置２０ａ，２０ｂへ送信されるコンテンツデータの符号化レートを変更する。これにより、配信システム１は、再生可能時間が比較的短い場合であっても、残余時間が相当長い場合には、符号化レートを比較的大きな値に設定することができる。この結果、符号化レートが無駄に小さくされることを防止することができる。

[0124] また、配信システム１は、再生可能時間が比較的長い場合であっても、残余時間が相当短い場合には、符号化レートを比較的小さな値に設定することができる。この結果、再生開始時刻における再生可能時間を十分に大きくす

ることができる。従って、端末装置２０ａ，２０ｂが設定された再生開始時刻にてコンテンツの再生を確実に開始することができる。

[0125] このように、上記配信システム１によれば、符号化レートが無駄に小さくされることを防止しながら、端末装置２０ａ，２０ｂが設定された再生開始時刻にてコンテンツの再生を確実に開始することができる。

[0126] 更に、上記配信システム１は、再生可能時間が目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を符号化レートとして決定するように構成される。

これによれば、再生開始時刻における再生可能時間を目標再生可能時間に十分に近づけることができる。この結果、符号化レートが無駄に小さくされることを防止しながら、端末装置２０ａ，２０ｂが設定された再生開始時刻にてコンテンツの再生を確実に開始することができる。

[0127] 加えて、上記配信システム１は、サーバ装置１０から端末装置２０ａ，２０ｂへ単位時間あたりに送信されたコンテンツデータのデータ量である通信速度を取得し、当該取得された通信速度に残余時間を乗じた値を、目標再生可能時間から再生可能時間を減じた値により除した値を符号化レートとして決定するように構成される。

これにより、再生開始時刻における再生可能時間を目標再生可能時間により一層確実に近づけることができる。

[0128] 更に、上記配信システム１は、再生可能時間の目標値である目標再生可能時間に基づいて再生開始時刻を設定するように構成される。

これにより、再生開始時刻における再生可能時間を目標再生可能時間に確実に近づけることができる。

[0129] 加えて、上記配信システム１は、複数の端末装置２０ａ，２０ｂのそれぞれに対して、当該端末装置がコンテンツの再生を開始するまでに要する時間である装置毎再生準備時間を算出し、当該算出された装置毎再生準備時間の最大値に基づいて、再生開始時刻を設定するように構成される。

[0130] これにより、複数の端末装置２０ａ，２０ｂのすべてが、再生開始時刻ま

でに再生可能時間を目標再生可能時間に確実に近づけることができる。この結果、複数の端末装置２０ａ，２０ｂ間で、コンテンツの再生位置を確実に一致させることができる。

[0131] 更に、上記配信システム１は、端末装置２０ａ，２０ｂがコンテンツを再生するために実行するアプリケーションプログラムが起動するために要する時間である起動時間と、目標再生可能時間と、に基づいて再生開始時刻を設定するように構成される。

これにより、端末装置２０ａ，２０ｂは、再生開始時刻にてコンテンツの再生を確実に開始することができる。

[0132] 加えて、上記配信システム１は、サーバ装置１０から端末装置２０ａ，２０ｂへ単位時間あたりに送信されたコンテンツデータのデータ量である通信速度と、目標再生可能時間と、に基づいて再生開始時刻を設定するように構成される。

これにより、再生開始時刻を適切に設定することができる。

[0133] 次に、端末装置２０ａ及び端末装置２０ｂが、同一のコンテンツを同期して再生している状態において、端末装置２０ｃが端末装置２０ａ及び端末装置２０ｂと同期してコンテンツを再生することを、端末装置２０ｃのユーザが希望する場合を想定して説明を続ける。

[0134] この場合、端末装置２０ｃのユーザは、セッション参加指示を入力する。これにより、端末装置２０ｃは、受信したセッションＩＤ「Ｓ０１」と、端末ＩＤ「Ｒ０３」と、起動時間「１５００」（ｍｓ）と、通信速度「８」（Ｍｂｐｓ）と、を含むセッション参加要求をサーバ装置１０へ送信する（図６のステップＳ３０１、図１３のステップＳ５０１）。

[0135] サーバ装置１０は、端末装置２０ｃからセッション参加要求を受信すると、図１４に示したように、記憶装置に記憶されているセッション情報のうちの、セッション参加要求に含まれるセッションＩＤ及び端末ＩＤを含むセッション情報に、セッション参加要求に含まれる起動時間及び通信速度を追加する。

[0136] そして、サーバ装置１０は、セッション参加要求を送信してきた端末装置２０ｃに対して、記憶装置に記憶されているコンテンツデータが有する符号化レートのうちの、通信速度以下であり且つ通信速度に最も近い符号化レートｒを特定する。本例では、サーバ装置１０は、端末装置２０ｃに対する符号化レートｒとして「４Ｍｂｐｓ」を特定する。

[0137] 次いで、サーバ装置１０は、セッション参加要求を送信してきた端末装置２０ｃに対して、記憶されているセッション情報に含まれる通信速度Ｂ及び起動時間T_aと、予め設定された目標再生可能時間T_dと、に基づいて装置毎再生準備時間T_pを算出する（図４のステップ２０３）。

[0138] 次いで、サーバ装置１０は、算出した装置毎再生準備時間T_pに基づいて再生開始時刻T_s（「１３：０５：２５」）を決定する（図４のステップＳ２０４）。そして、サーバ装置１０は、図１５に示したように、セッションＩＤ「Ｓ０１」及び端末ＩＤ「Ｒ０３」を含むセッション情報に、決定した再生開始時刻を追加する。

[0139] 次いで、サーバ装置１０は、セッション参加要求を送信してきた端末装置２０ｃへ、決定した再生開始時刻T_sを送信する（図４のステップＳ２０５、図１３のステップＳ５０２）。これにより、端末装置２０ｃは、サーバ装置１０から再生開始時刻T_sを受信する（図６のステップＳ３０２）。

[0140] そして、サーバ装置１０は、決定した再生開始時刻T_sが、受信したセッション参加要求と同一のセッションＩＤを含む他のセッション参加要求に基づいて決定された再生開始時刻よりも後の時刻であるか否かを判定する（図４のステップＳ２０６）。

[0141] この時点では、端末装置２０ｃ（第２の受信装置）から受信したセッション参加要求に基づいて決定した再生開始時刻（第２の再生開始時刻）は、端末装置２０ａ（第１の受信装置）及び端末装置２０ｂから受信したセッション参加要求に基づいて決定した再生開始時刻（第１の再生開始時刻）よりも後の時刻である。また、端末装置２０ａ及び端末装置２０ｂから受信したセッション参加要求は、端末装置２０ｃから受信したセッション参加要求に含

まれるセッションＩＤと同一のセッションＩＤを含む。即ち、上記決定した再生開始時刻T_sは、受信したセッション参加要求と同一のセッションＩＤを含む他のセッション参加要求に基づいて決定された再生開始時刻よりも後の時刻である。

[0142] 従って、サーバ装置１０は、「Ｙｅｓ」と判定してステップＳ２０７へ進み、先頭位置から、第１の再生開始時刻と第２の再生開始時刻との差だけ後の位置を送信開始位置として決定する。そして、サーバ装置１０は、ステップＳ２０８へ進み、上記決定した送信開始位置から、端末装置２０ｃへのコンテンツデータの送信を開始する（図１３のステップＳ５０３）。

[0143] このとき、サーバ装置１０が端末装置２０ｃへ送信するコンテンツデータは、セッションＩＤ「Ｓ０１」を含むセッション情報に含まれるコンテンツＩＤ「Ｃ０１」により識別されるコンテンツを表すコンテンツデータである。更に、このコンテンツデータは、端末装置２０ｃから受信したセッション参加要求に含まれる通信速度に基づいて特定された符号化レートにて符号化されたデータである。

[0144] 上述した場合と同様に、端末装置２０ｃは、送信周期が経過する毎に、再生可能時間を含む再生可能時間情報をサーバ装置１０へ送信する（図１３のステップＳ５０４）。

そして、サーバ装置１０は、端末装置２０ｃから再生可能時間情報を受信する毎に、端末装置２０ｃに対して符号化レート変更制御を行う（図１３のステップＳ５０５）。

[0145] その後、端末装置２０ｃは、現時点の時刻が、サーバ装置１０から受信した再生開始時刻に到達すると、記憶装置に記憶されているコンテンツデータに基づいてコンテンツの再生を開始する（図１３のステップＳ５０６）。

[0146] これにより、複数の端末装置２０ａ～２０ｃ間で、コンテンツの再生位置を確実に一致させることができる。即ち、複数の端末装置２０ａ～２０ｃ間で、同一のコンテンツを同期して再生することができる。

[0147] 以上、説明したように、本発明の第１実施形態に係る配信システム１によ

れば、符号化レートが無駄に小さくされることを防止しながら、端末装置２０ａ～２０ｃが設定された再生開始時刻にてコンテンツの再生を確実に開始することができる。

[0148] なお、上記第１実施形態に係る配信システム１は、サーバ装置１０が、残余時間と再生可能時間とに基づいて符号化レートを決定するように構成されていたが、各端末装置２０ａ～２０ｃが、残余時間と再生可能時間とに基づいて符号化レートを決定するように構成されていてもよい。この場合、各端末装置２０ａ～２０ｃは、決定した符号化レートをサーバ装置１０へ送信するように構成される。

[0149] また、上記第１実施形態に係る配信システム１は、複数の端末装置２０ａ～２０ｃのそれぞれが再生するコンテンツの再生位置を当該複数の端末装置２０ａ～２０ｃ間で一致させるように構成されていたが、複数の端末装置２０ａ～２０ｃのそれぞれが再生するコンテンツの再生位置が互いに異なっていてもよい。

[0150] また、上記第１実施形態に係る配信システム１は、端末装置間でコンテンツデータを授受するように構成されていてもよい。

また、上記第１実施形態に係る配信システム１が含む端末装置の数は、３つであったが、２つであってもよく、４つ以上であってもよい。

[0151] なお、上記第１実施形態において配信システム１の各機能は、ＣＰＵがプログラム（ソフトウェア）を実行することにより実現されていたが、回路等のハードウェアにより実現されていてもよい。

[0152] ＜第２実施形態＞

次に、本発明の第２実施形態に係る通信システムについて図１６を参照しながら説明する。

第２実施形態に係る配信システム１００は、互いに通信可能に構成された送信装置１１０及び受信装置１２０を含むシステムである。

[0153] 送信装置１１０は、１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを受信装置

１２０へ送信するコンテンツ送信部（コンテンツ送信手段）１１１を備える。

受信装置１２０は、送信装置１１０により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて上記コンテンツを再生するコンテンツ再生部（コンテンツ再生手段）１２１を備える。

[0154] 配信システム１００は、

現時点から、受信装置１２０が上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、受信装置１２０の上記記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて、上記符号化レートを決定する符号化レート決定部（符号化レート決定手段）１３１を備える。

[0155] コンテンツ送信部１１１は、受信装置１２０へ送信するコンテンツデータの上記符号化レートを、上記決定された符号化レートに変更するように構成される。

コンテンツ再生部１２１は、上記設定された再生開始時刻にて、上記コンテンツの再生を開始するように構成される。

[0156] これによれば、配信システム１００は、残余時間及び再生可能時間の両方に基づいて、送信装置１１０から受信装置１２０へ送信されるコンテンツデータの符号化レートを変更する。これにより、配信システム１００は、再生可能時間が比較的短い場合であっても、残余時間が相当長い場合には、符号化レートを比較的大きな値に設定することができる。この結果、符号化レートが無駄に小さくされることを防止することができる。

[0157] また、配信システム１００は、再生可能時間が比較的長い場合であっても、残余時間が相当短い場合には、符号化レートを比較的小さな値に設定することができる。この結果、再生開始時刻における再生可能時間を十分に大きくすることができる。従って、受信装置１２０が設定された再生開始時刻にてコンテンツの再生を確実に開始することができる。

[0158] このように、配信システム１００によれば、符号化レートが無駄に小さくされることを防止しながら、受信装置１２０が設定された再生開始時刻にてコンテンツの再生を確実に開始することができる。

[0159] この場合、上記符号化レート決定手段は、上記再生可能時間が、当該再生可能時間の目標値である目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を上記符号化レートとして決定するように構成されることが好適である。

[0160] これによれば、再生開始時刻における再生可能時間を目標再生可能時間に十分に近づけることができる。この結果、符号化レートが無駄に小さくされることを防止しながら、受信装置が設定された再生開始時刻にてコンテンツの再生を確実に開始することができる。

[0161] この場合、上記符号化レート決定手段は、上記送信装置から上記受信装置へ単位時間あたりに送信されたコンテンツデータのデータ量である通信速度を取得し、当該取得された通信速度に上記残余時間を乗じた値を、上記目標再生可能時間から上記再生可能時間を減じた値により除した値を上記符号化レートとして決定するように構成されることが好適である。

[0162] 再生可能時間が増加する程度は、通信速度に応じて変化する。従って、上記のように配信システムを構成することにより、再生開始時刻における再生可能時間を目標再生可能時間により一層確実に近づけることができる。

[0163] この場合、上記符号化レート決定手段は、予め設定された変更周期が経過する毎に、上記符号化レートを決定するように構成されることが好適である。

[0164] この場合、上記配信システムは、

上記受信装置を複数含み、

上記複数の受信装置のそれぞれが再生するコンテンツの再生位置を当該複数の受信装置間で一致させる同期再生制御手段を備えることが好適である。

[0165] これによれば、複数の受信装置間で、コンテンツの再生位置を確実に一致させることができる。

[0166] この場合、上記配信システムは、

上記再生可能時間の目標値である目標再生可能時間に基づいて上記再生開始時刻を設定する再生開始時刻設定手段を備えることが好適である。

[0167] 目標再生可能時間が長くなるほど、再生可能時間が目標再生可能時間に一致するまでに要する時間が長くなる。従って、上記構成のように、目標再生可能時間に基づいて再生開始時刻を設定することにより、再生開始時刻における再生可能時間を目標再生可能時間に確実に近づけることができる。

[0168] この場合、上記コンテンツ送信手段は、上記複数の受信装置の１つである第１の受信装置に対して設定された再生開始時刻である第１の再生開始時刻よりも、当該複数の受信装置の他の１つである第２の受信装置に対して設定された再生開始時刻である第２の再生開始時刻が後の時刻である場合、当該第２の再生開始時刻にて当該第１の受信装置が再生しているコンテンツの再生位置を推定し、上記コンテンツデータのうちの、当該推定された再生位置以降の部分を当該第２の受信装置へ送信するように構成されることが好適である。

[0169] この場合、上記再生開始時刻設定手段は、上記複数の受信装置のそれぞれに対して、当該受信装置が上記コンテンツの再生を開始するまでに要する時間である装置毎再生準備時間を算出し、当該算出された装置毎再生準備時間の最大値に基づいて、上記再生開始時刻を設定するように構成されることが好適である。

[0170] ところで、複数の受信装置間で受信速度が相違することが多い。従って、上記のように配信システムを構成することにより、複数の受信装置のすべてが、再生開始時刻までに再生可能時間を目標再生可能時間に確実に近づけることができる。この結果、複数の受信装置間で、コンテンツの再生位置を確実に一致させることができる。

[0171] この場合、上記再生開始時刻設定手段は、上記受信装置が上記コンテンツを再生するために実行するアプリケーションプログラムが起動するために要する時間である起動時間と、上記目標再生可能時間と、に基づいて上記再生

開始時刻を設定するように構成されることが好適である。

[0172] ところで、受信装置がコンテンツの再生を開始するまでに要する時間は、起動時間と、再生可能時間が目標再生可能時間に到達するまでに要する時間と、を含む。従って、上記のように配信システムを構成することにより、受信装置は、再生開始時刻にてコンテンツの再生を確実に開始することができる。

[0173] この場合、上記再生開始時刻設定手段は、上記送信装置から上記受信装置へ単位時間あたりに送信されたコンテンツデータのデータ量である通信速度と、上記目標再生可能時間と、に基づいて上記再生開始時刻を設定するように構成されることが好適である。

[0174] ところで、再生可能時間が目標再生可能時間に到達するまでに要する時間は、通信速度に応じて変動する。従って、上記のように配信システムを構成することにより、再生開始時刻を適切に設定することができる。

[0175] また、本発明の他の形態である配信方法は、

互いに通信可能に構成された送信装置及び受信装置を含む配信システムに適用され、

上記送信装置が、１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを上記受信装置へ送信し、

上記受信装置が、上記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて上記コンテンツを再生し、

現時点から、上記受信装置が上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記受信装置の上記記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて、上記符号化レートを決定し、

上記送信装置が上記受信装置へ送信するコンテンツデータの上記符号化レ

ートを、上記決定された符号化レートに変更し、

上記受信装置は、上記設定された再生開始時刻にて、上記コンテンツの再生を開始する方法である。

[0176] この場合、上記配信方法は、

上記再生可能時間が、当該再生可能時間の目標値である目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を上記符号化レートとして決定するように構成されることが好適である。

[0177] この場合、上記配信方法は、

上記送信装置から上記受信装置へ単位時間あたりに送信されたコンテンツデータのデータ量である通信速度を取得し、当該取得された通信速度に上記残余時間を乗じた値を、上記目標再生可能時間から上記再生可能時間を減じた値により除した値を上記符号化レートとして決定するように構成されることが好適である。

[0178] この場合、上記配信方法は、

予め設定された変更周期が経過する毎に、上記符号化レートを決定するように構成されることが好適である。

[0179] この場合、上記配信方法は、

上記配信システムが、上記受信装置を複数含み、

上記複数の受信装置のそれぞれが再生するコンテンツの再生位置を当該複数の受信装置間で一致させることが好適である。

[0180] また、本発明の他の形態である送信装置は、受信装置と通信可能に構成された装置である。

更に、この送信装置は、

１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを上記受信装置へ送信するコンテンツ送信手段を備え、

上記コンテンツ送信手段は、現時点から、上記受信装置が上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上

記受信装置の記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて決定された符号化レートに、上記受信装置へ送信する上記コンテンツデータの符号化レートを変更するように構成される。

[0181] この場合、上記送信装置は、

上記残余時間と上記再生可能時間とに基づいて上記符号化レートを決定する符号化レート決定手段を備えることが好適である。

[0182] この場合、上記符号化レート決定手段は、上記再生可能時間が、当該再生可能時間の目標値である目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を上記符号化レートとして決定するように構成されることが好適である。

[0183] この場合、上記符号化レート決定手段は、上記送信装置から上記受信装置へ単位時間あたりに送信されたコンテンツデータのデータ量である通信速度を取得し、当該取得された通信速度に上記残余時間を乗じた値を、上記目標再生可能時間から上記再生可能時間を減じた値により除した値を上記符号化レートとして決定するように構成されることが好適である。

[0184] この場合、上記符号化レート決定手段は、予め設定された変更周期が経過する毎に、上記符号化レートを決定するように構成されることが好適である。

[0185] また、本発明の他の形態であるプログラムは、

受信装置と通信可能に構成された送信装置に、

１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを上記受信装置へ送信するコンテンツ送信手段を実現させるとともに、

上記コンテンツ送信手段は、現時点から、上記受信装置が上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記受信装置の記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて決定され

た符号化レートに、上記受信装置へ送信する上記コンテンツデータの符号化レートを変更するように構成される。

[0186] また、本発明の他の形態である受信装置は、送信装置と通信可能に構成された装置である。

更に、この受信装置は、

１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化され且つ上記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて上記コンテンツを再生するコンテンツ再生手段と、

現時点から、上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて、上記符号化レートを決定する符号化レート決定手段と、を備え、

上記コンテンツ再生手段は、上記決定された符号化レートにて符号化されたコンテンツデータを受信するように構成され、且つ、上記設定された再生開始時刻にて、上記コンテンツの再生を開始するように構成される。

[0187] この場合、上記符号化レート決定手段は、上記再生可能時間が、当該再生可能時間の目標値である目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を上記符号化レートとして決定するように構成されることが好適である。

[0188] この場合、上記符号化レート決定手段は、上記送信装置から単位時間あたりに送信されたコンテンツデータのデータ量である通信速度を取得し、当該取得された通信速度に上記残余時間を乗じた値を、上記目標再生可能時間から上記再生可能時間を減じた値により除した値を上記符号化レートとして決定するように構成されることが好適である。

[0189] この場合、上記符号化レート決定手段は、予め設定された変更周期が経過

する毎に、上記符号化レートを決定するように構成されることが好適である。

[0190] また、本発明の他の形態であるプログラムは、

送信装置と通信可能に構成された受信装置に、

１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化され且つ上記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて上記コンテンツを再生するコンテンツ再生手段と、

現時点から、上記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、上記記憶装置に記憶されている上記コンテンツデータに基づいて上記コンテンツを再生可能な時間である再生可能時間と、に基づいて、上記符号化レートを決定する符号化レート決定手段と、を実現させるとともに、

上記コンテンツ再生手段は、上記決定された符号化レートにて符号化されたコンテンツデータを受信するように構成され、且つ、上記設定された再生開始時刻にて、上記コンテンツの再生を開始するように構成される。

[0191] 上述した構成を有する、配信方法、送信装置、プログラム、又は、受信装置、の発明であっても、上記配信システムと同様の作用を有するために、上述した本発明の目的を達成することができる。

[0192] 以上、上記実施形態を参照して本願発明を説明したが、本願発明は、上述した実施形態に限定されるものではない。本願発明の構成及び詳細に、本願発明の範囲内において当業者が理解し得る様々な変更をすることができる。

[0193] また、上記各実施形態においてプログラムは、記憶装置に記憶されていたが、コンピュータが読み取り可能な記録媒体に記憶されていてもよい。例えば、記録媒体は、フレキシブルディスク、光ディスク、光磁気ディスク、及び、半導体メモリ等の可搬性を有する媒体である。

[0194] また、上記実施形態の他の変形例として、上述した実施形態及び変形例の

任意の組み合わせが採用されてもよい。

[0195] なお、本発明は、日本国にて２００９年１１月５日に出願された特願２００９－２５３５８１の特許出願に基づく優先権主張の利益を享受するものであり、当該特許出願にて開示された内容のすべてが本明細書に含まれるものとする。

産業上の利用可能性

[0196] 本発明は、コンテンツを表すコンテンツデータを送信装置から受信装置へ送信する配信システム等に適用可能である。

符号の説明

[0197] １ 配信システム

１０ サーバ装置

２０ａ，２０ｂ，２０ｃ 端末装置

３１ 要求送信部

３２ 同期再生制御部

３２ａ 再生開始時刻受信部

３３ コンテンツ再生部

３３ａ コンテンツ受信部

３３ｂ バッファ部

３３ｃ コンテンツ再生実行部

３４ 再生可能時間送信部

４１ 要求受信部

４２ セッション情報記憶部

４３ 再生開始時刻設定部

４３ａ 再生開始時刻決定部

４３ｂ 再生開始時刻送信部

４４ コンテンツデータ記憶部

４５ コンテンツ送信部

４６ 再生可能時間受信部

４７　　符号化レート決定部

１００　配信システム

１１０　送信装置

１１１　コンテンツ送信部

１２０　受信装置

１２１　コンテンツ再生部

１３１　符号化レート決定部

ＮＷ　　通信回線

請求の範囲

[請求項1] 互いに通信可能に構成された送信装置及び受信装置を含む配信システムであって、

前記送信装置は、１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを前記受信装置へ送信するコンテンツ送信手段を備え、

前記受信装置は、前記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて前記コンテンツを再生するコンテンツ再生手段を備え、

前記配信システムは、

現時点から、前記受信装置が前記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、前記受信装置の前記記憶装置に記憶されている前記コンテンツデータに基づいて前記コンテンツを再生可能な時間である再生可能時間と、に基づいて、前記符号化レートを決定する符号化レート決定手段を備え、

前記コンテンツ送信手段は、前記受信装置へ送信するコンテンツデータの前記符号化レートを、前記決定された符号化レートに変更するように構成され、

前記コンテンツ再生手段は、前記設定された再生開始時刻にて、前記コンテンツの再生を開始するように構成された配信システム。

[請求項2] 請求項１に記載の配信システムであって、

前記符号化レート決定手段は、前記再生可能時間が、当該再生可能時間の目標値である目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を前記符号化レートとして決定するように構成された配信システム。

[請求項3] 請求項２に記載の配信システムであって、

前記符号化レート決定手段は、前記送信装置から前記受信装置へ単

位時間あたりに送信されたコンテンツデータのデータ量である通信速度を取得し、当該取得された通信速度に前記残余時間を乗じた値を、前記目標再生可能時間から前記再生可能時間を減じた値により除した値を前記符号化レートとして決定するように構成された配信システム。

[請求項4] 請求項１乃至請求項３のいずれか一項に記載の配信システムであって、

前記符号化レート決定手段は、予め設定された変更周期が経過する毎に、前記符号化レートを決定するように構成された配信システム。

[請求項5] 請求項１乃至請求項４のいずれか一項に記載の配信システムであって、

前記受信装置を複数含み、

前記複数の受信装置のそれぞれが再生するコンテンツの再生位置を当該複数の受信装置間で一致させる同期再生制御手段を備える配信システム。

[請求項6] 請求項５に記載の配信システムであって、

前記再生可能時間の目標値である目標再生可能時間に基づいて前記再生開始時刻を設定する再生開始時刻設定手段を備える配信システム。

[請求項7] 請求項５又は請求項６に記載の配信システムであって、

前記コンテンツ送信手段は、前記複数の受信装置の１つである第１の受信装置に対して設定された再生開始時刻である第１の再生開始時刻よりも、当該複数の受信装置の他の１つである第２の受信装置に対して設定された再生開始時刻である第２の再生開始時刻が後の時刻である場合、当該第２の再生開始時刻にて当該第１の受信装置が再生しているコンテンツの再生位置を推定し、前記コンテンツデータのうちの、当該推定された再生位置以降の部分を当該第２の受信装置へ送信するように構成された配信システム。

[請求項8] 請求項６又は請求項７に記載の配信システムであって、

前記再生開始時刻設定手段は、前記複数の受信装置のそれぞれに対して、当該受信装置が前記コンテンツの再生を開始するまでに要する時間である装置毎再生準備時間を算出し、当該算出された装置毎再生準備時間の最大値に基づいて、前記再生開始時刻を設定するように構成された配信システム。

[請求項9] 請求項６乃至請求項８のいずれか一項に記載の配信システムであって、

前記再生開始時刻設定手段は、前記受信装置が前記コンテンツを再生するために実行するアプリケーションプログラムが起動するために要する時間である起動時間と、前記目標再生可能時間と、に基づいて前記再生開始時刻を設定するように構成された配信システム。

[請求項10] 請求項６乃至請求項９のいずれか一項に記載の配信システムであって、

前記再生開始時刻設定手段は、前記送信装置から前記受信装置へ単位時間あたりに送信されたコンテンツデータのデータ量である通信速度と、前記目標再生可能時間と、に基づいて前記再生開始時刻を設定するように構成された配信システム。

[請求項11] 互いに通信可能に構成された送信装置及び受信装置を含む配信システムに適用され、

前記送信装置が、１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを前記受信装置へ送信し、

前記受信装置が、前記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて前記コンテンツを再生し、

現時点から、前記受信装置が前記コンテンツの再生を開始する時刻

として設定された再生開始時刻までの残余時間と、前記受信装置の前記記憶装置に記憶されている前記コンテンツデータに基づいて前記コンテンツを再生可能な時間である再生可能時間と、に基づいて、前記符号化レートを決定し、

前記送信装置が前記受信装置へ送信するコンテンツデータの前記符号化レートを、前記決定された符号化レートに変更し、

前記受信装置は、前記設定された再生開始時刻にて、前記コンテンツの再生を開始する、配信方法。

[請求項12] 請求項１１に記載の配信方法であって、

前記再生可能時間が、当該再生可能時間の目標値である目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を前記符号化レートとして決定するように構成された配信方法。

[請求項13] 請求項１２に記載の配信方法であって、

前記送信装置から前記受信装置へ単位時間あたりに送信されたコンテンツデータのデータ量である通信速度を取得し、当該取得された通信速度に前記残余時間を乗じた値を、前記目標再生可能時間から前記再生可能時間を減じた値により除した値を前記符号化レートとして決定するように構成された配信方法。

[請求項14] 請求項１１乃至請求項１３のいずれか一項に記載の配信方法であって、

予め設定された変更周期が経過する毎に、前記符号化レートを決定するように構成された配信方法。

[請求項15] 請求項１１乃至請求項１４のいずれか一項に記載の配信方法であって、

前記配信システムは、前記受信装置を複数含み、

前記複数の受信装置のそれぞれが再生するコンテンツの再生位置を当該複数の受信装置間で一致させる、配信方法。

[請求項16] 受信装置と通信可能に構成された送信装置であって、

１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを前記受信装置へ送信するコンテンツ送信手段を備え、

前記コンテンツ送信手段は、現時点から、前記受信装置が前記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、前記受信装置の記憶装置に記憶されている前記コンテンツデータに基づいて前記コンテンツを再生可能な時間である再生可能時間と、に基づいて決定された符号化レートに、前記受信装置へ送信する前記コンテンツデータの符号化レートを変更するように構成された送信装置。

[請求項17] 請求項１６に記載の送信装置であって、

前記残余時間と前記再生可能時間とに基づいて前記符号化レートを決定する符号化レート決定手段を備える送信装置。

[請求項18] 請求項１６又は請求項１７に記載の送信装置であって、

前記符号化レート決定手段は、前記再生可能時間が、当該再生可能時間の目標値である目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を前記符号化レートとして決定するように構成された送信装置。

[請求項19] 請求項１８に記載の送信装置であって、

前記符号化レート決定手段は、前記送信装置から前記受信装置へ単位時間あたりに送信されたコンテンツデータのデータ量である通信速度を取得し、当該取得された通信速度に前記残余時間を乗じた値を、前記目標再生可能時間から前記再生可能時間を減じた値により除した値を前記符号化レートとして決定するように構成された送信装置。

[請求項20] 請求項１６乃至請求項１９のいずれか一項に記載の送信装置であって、

前記符号化レート決定手段は、予め設定された変更周期が経過する

毎に、前記符号化レートを決定するように構成された送信装置。

[請求項21] 受信装置と通信可能に構成された送信装置に、

１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化されたコンテンツデータを前記受信装置へ送信するコンテンツ送信手段を実現させるとともに、

前記コンテンツ送信手段は、現時点から、前記受信装置が前記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、前記受信装置の記憶装置に記憶されている前記コンテンツデータに基づいて前記コンテンツを再生可能な時間である再生可能時間と、に基づいて決定された符号化レートに、前記受信装置へ送信する前記コンテンツデータの符号化レートを変更するように構成されたプログラム。

[請求項22] 送信装置と通信可能に構成された受信装置であって、

１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化され且つ前記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて前記コンテンツを再生するコンテンツ再生手段と、

現時点から、前記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、前記記憶装置に記憶されている前記コンテンツデータに基づいて前記コンテンツを再生可能な時間である再生可能時間と、に基づいて、前記符号化レートを決定する符号化レート決定手段と、を備え、

前記コンテンツ再生手段は、前記決定された符号化レートにて符号化されたコンテンツデータを受信するように構成され、且つ、前記設定された再生開始時刻にて、前記コンテンツの再生を開始するように構成された受信装置。

[請求項23] 請求項２２に記載の受信装置であって、

前記符号化レート決定手段は、前記再生可能時間が、当該再生可能時間の目標値である目標再生可能時間よりも短くなるほど小さくなり、且つ、残余時間が短くなるほど小さくなる値を前記符号化レートとして決定するように構成された受信装置。

[請求項24] 請求項２３に記載の受信装置であって、

前記符号化レート決定手段は、前記送信装置から単位時間あたりに送信されたコンテンツデータのデータ量である通信速度を取得し、当該取得された通信速度に前記残余時間を乗じた値を、前記目標再生可能時間から前記再生可能時間を減じた値により除した値を前記符号化レートとして決定するように構成された受信装置。

[請求項25] 請求項２２乃至請求項２４のいずれか一項に記載の受信装置であって、

前記符号化レート決定手段は、予め設定された変更周期が経過する毎に、前記符号化レートを決定するように構成された受信装置。

[請求項26] 送信装置と通信可能に構成された受信装置に、

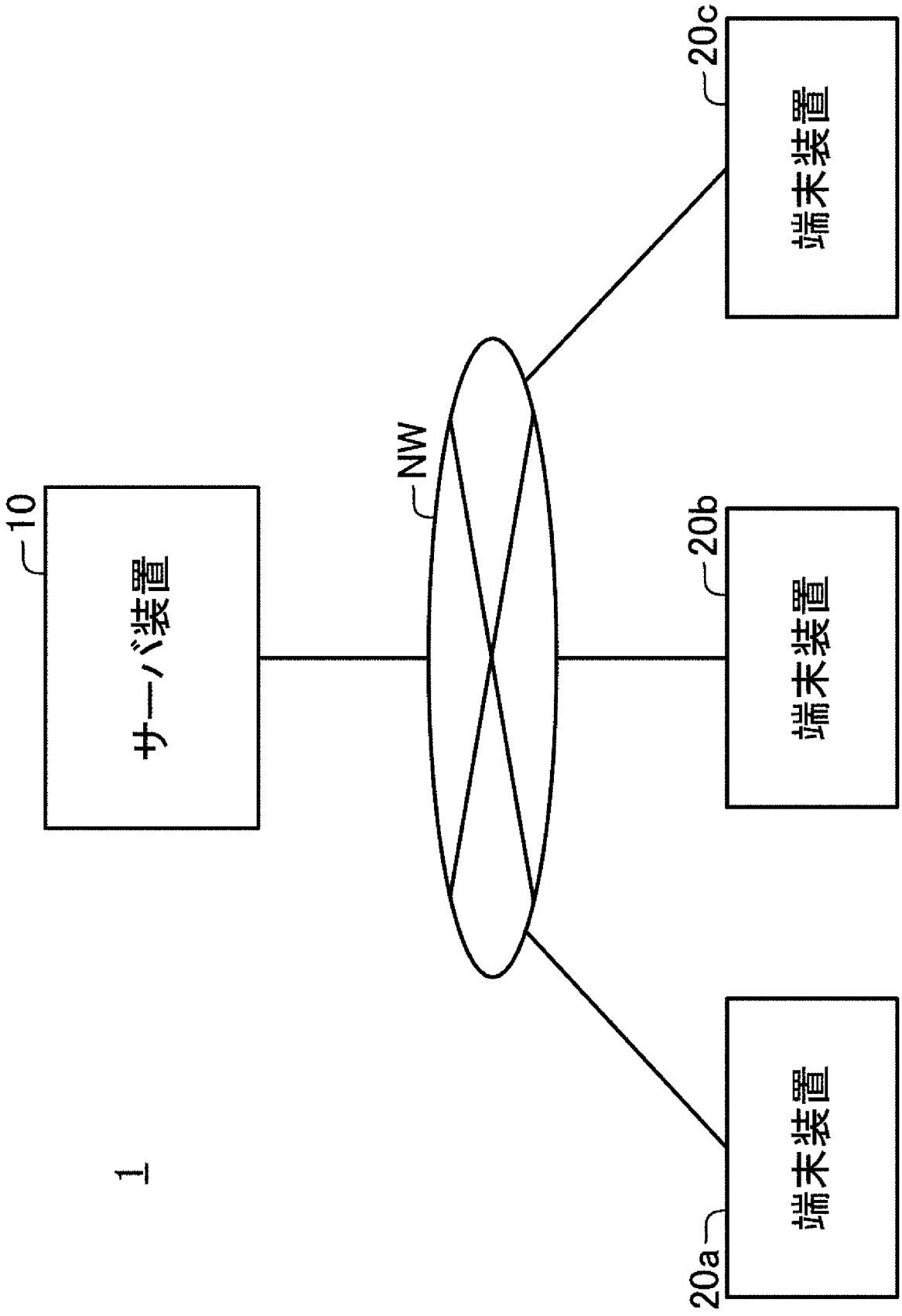
１つのコンテンツが複数の異なる符号化レートのうちの任意の１つの符号化レートにて符号化され且つ前記送信装置により送信されたコンテンツデータを受信しながら、当該コンテンツデータのうちの受信されたデータを記憶装置に記憶させるとともに当該記憶されているデータに基づいて前記コンテンツを再生するコンテンツ再生手段と、

現時点から、前記コンテンツの再生を開始する時刻として設定された再生開始時刻までの残余時間と、前記記憶装置に記憶されている前記コンテンツデータに基づいて前記コンテンツを再生可能な時間である再生可能時間と、に基づいて、前記符号化レートを決定する符号化レート決定手段と、を実現させるとともに、

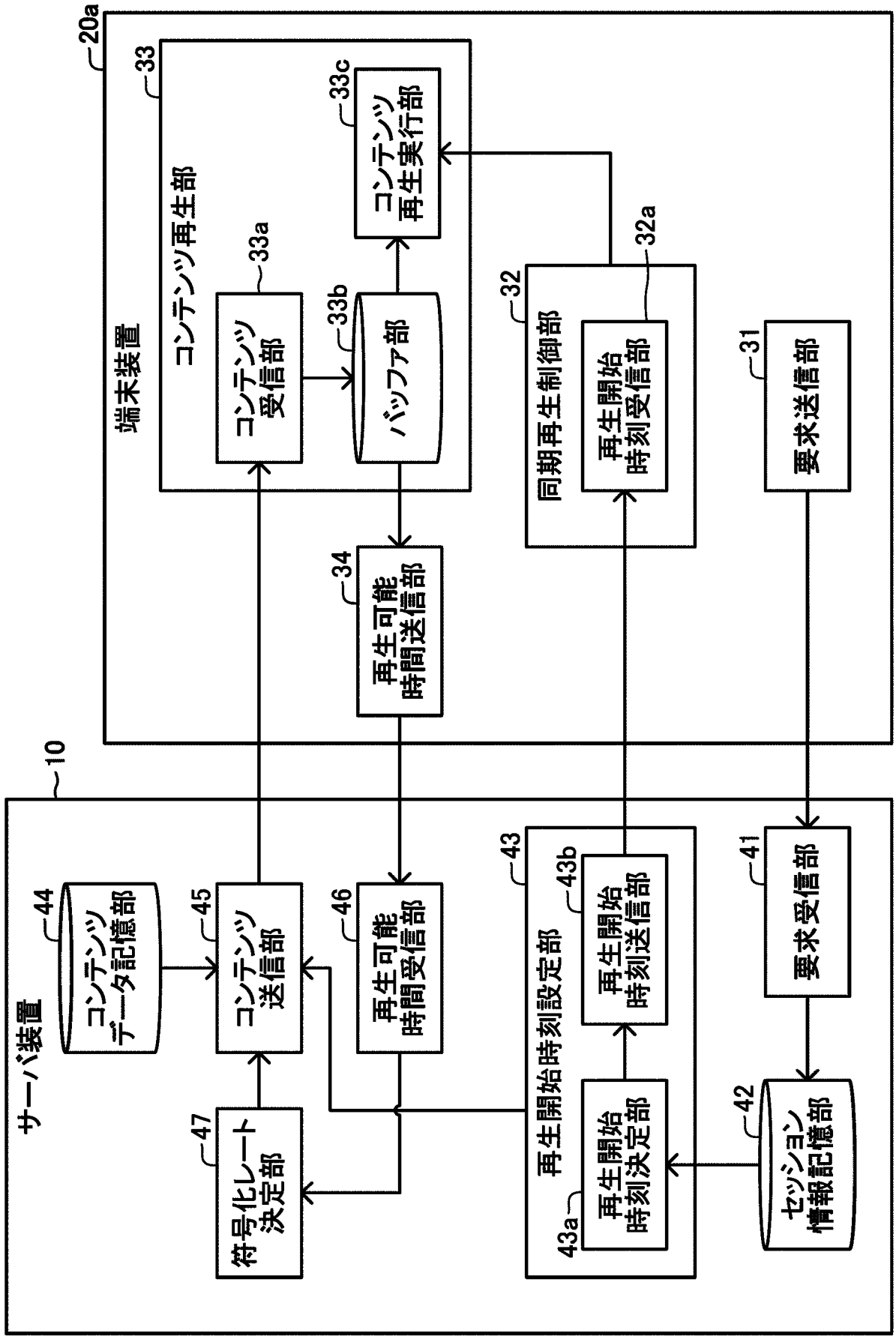
前記コンテンツ再生手段は、前記決定された符号化レートにて符号化されたコンテンツデータを受信するように構成され、且つ、前記設定された再生開始時刻にて、前記コンテンツの再生を開始するように

構成されたプログラム。

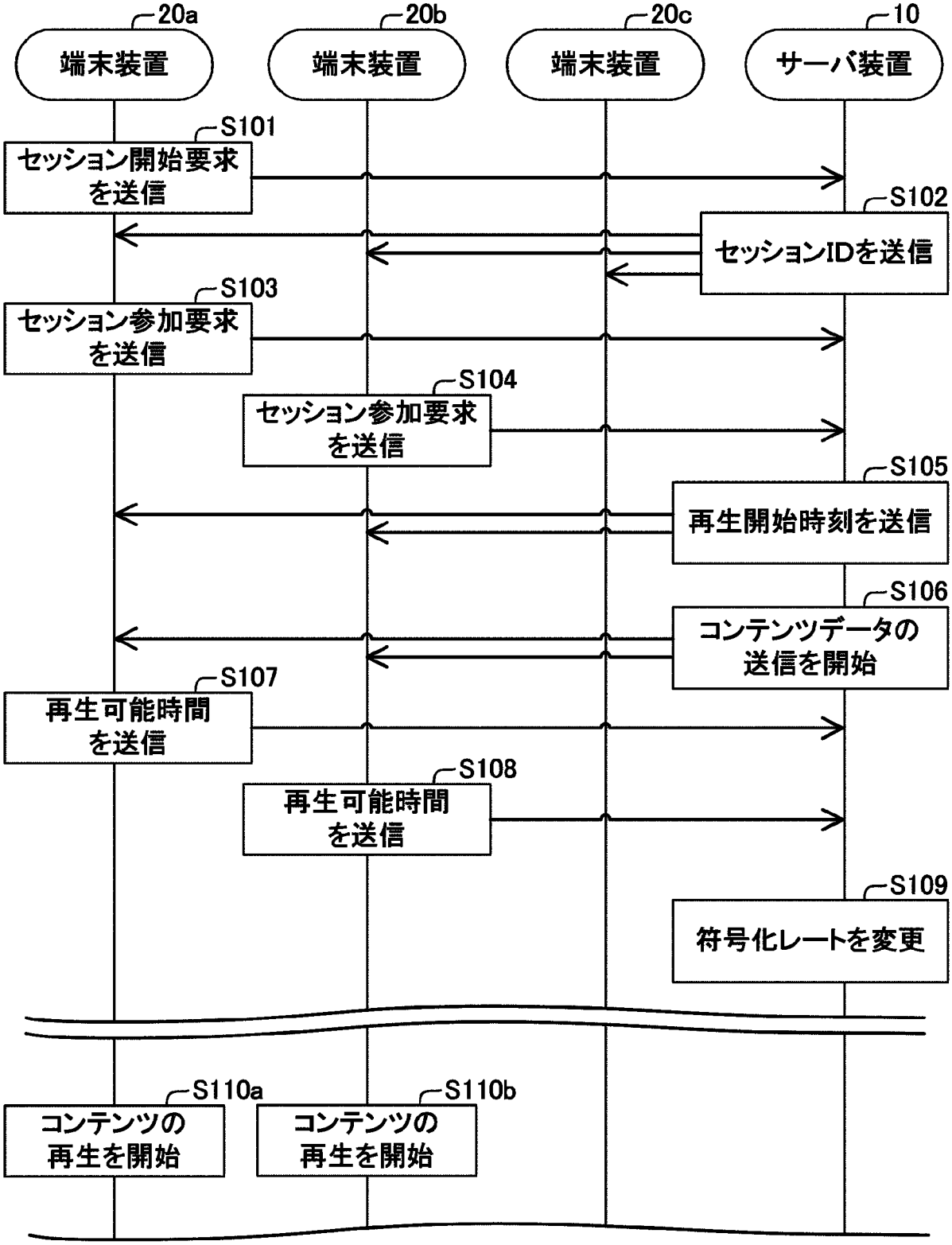
[図1]



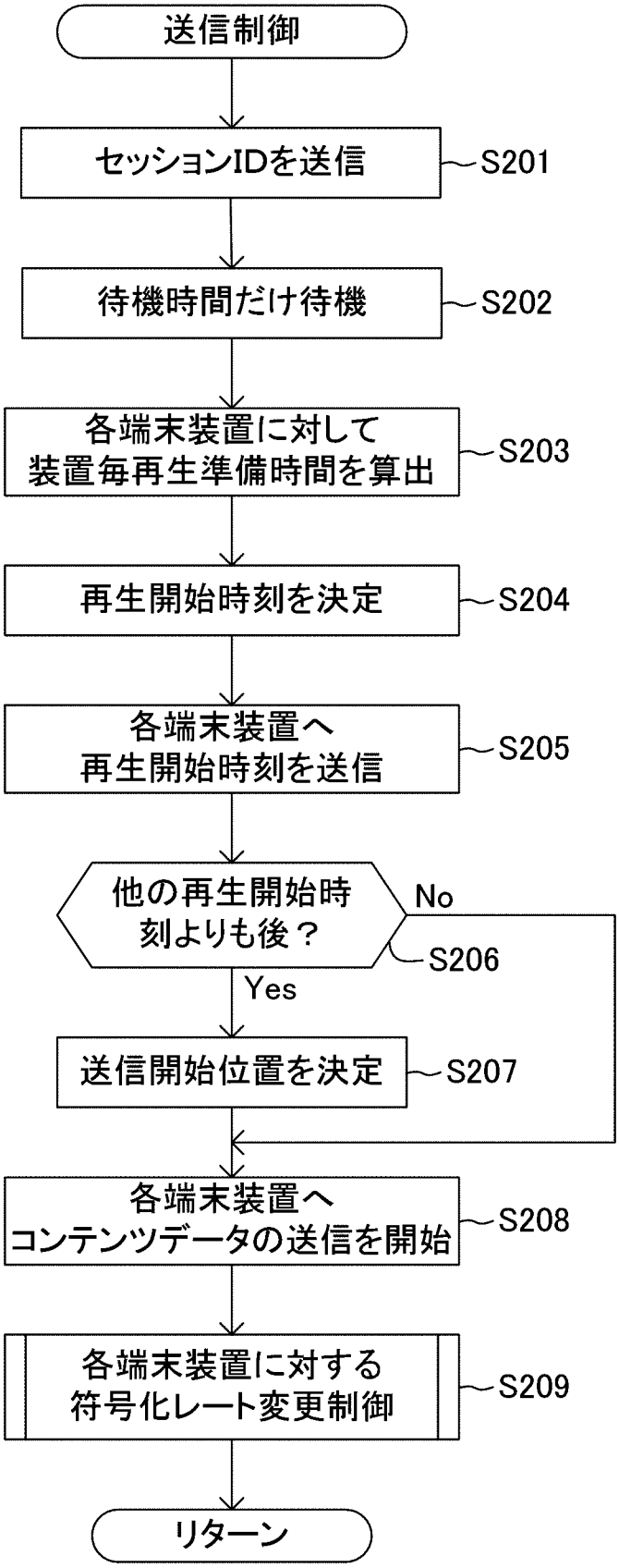
[図2]


20a
端末装置
33
コンテンツ再生部
33c
コンテンツ再生実行部
33a
コンテンツ受信部
33b
バッファ部
32
同期再生制御部
32a
再生開始時刻受信部
31
要求送信部
34
再生可能時間送信部
10
サーバ装置
44
コンテンツデータ記憶部
45
コンテンツ送信部
46
再生可能時間受信部
43
再生開始時刻設定部
43b
再生開始時刻送信部
41
要求受信部
47
符号化レート決定部
43a
再生開始時刻決定部
42
セッション情報記憶部

[図3]


20a
端末装置
20b
端末装置
20c
端末装置
10
サーバ装置
S101
セッション開始要求を送信
S102
セッションIDを送信
S103
セッション参加要求を送信
S104
セッション参加要求を送信
S105
再生開始時刻を送信
S106
コンテンツデータの送信を開始
S107
再生可能時間を送信
S108
再生可能時間を送信
S109
符号化レートを変更
S110a
コンテンツの再生を開始
S110b
コンテンツの再生を開始

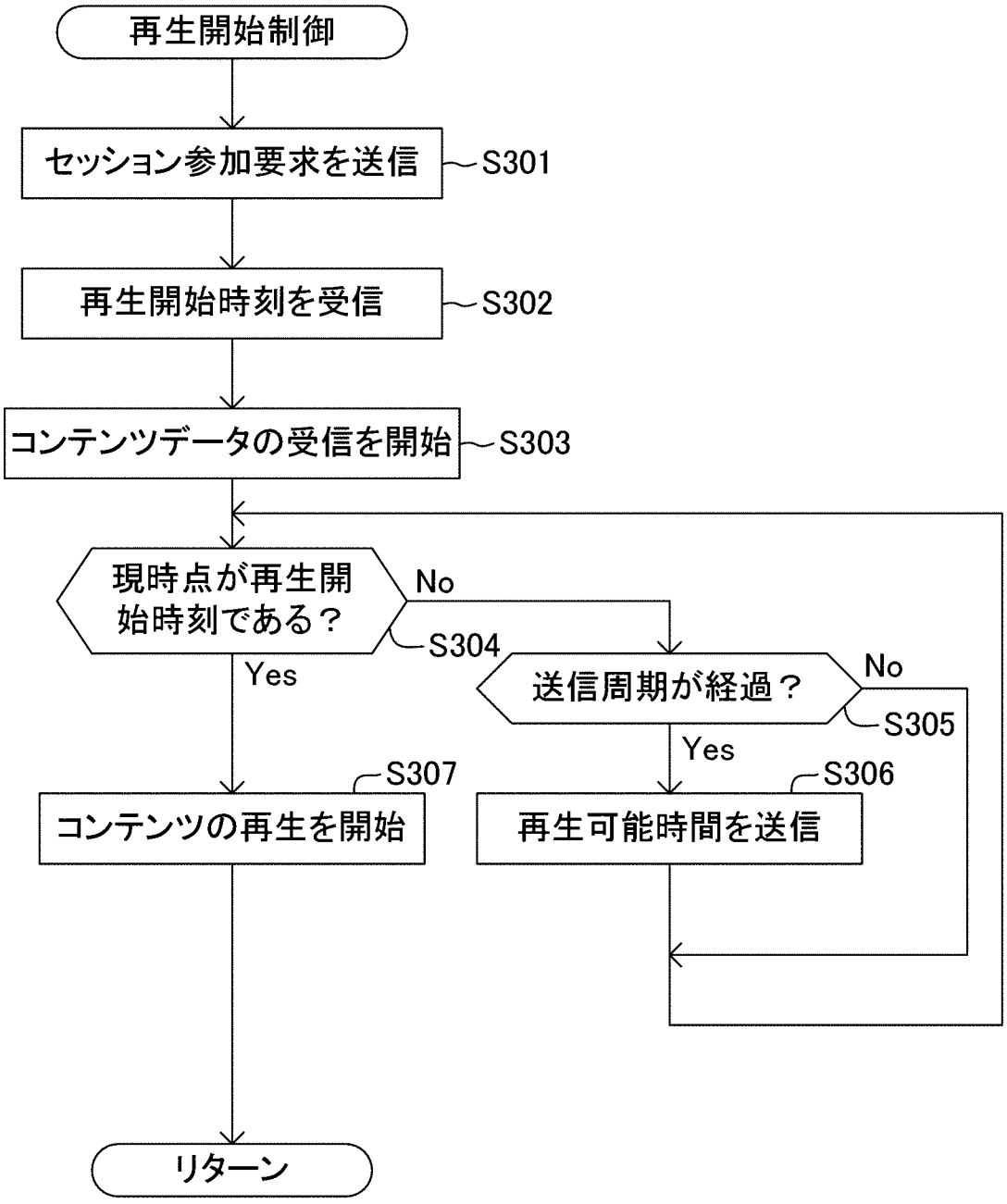
[図4]


送信制御
セッションIDを送信
S201
待機時間だけ待機
S202
各端末装置に対して
装置毎再生準備時間を算出
S203
再生開始時刻を決定
S204
各端末装置へ
再生開始時刻を送信
S205
他の再生開始時
刻よりも後？
No
S206
Yes
送信開始位置を決定
S207
各端末装置へ
コンテンツデータの送信を開始
S208
各端末装置に対する
符号化レート変更制御
S209
リターン

[図5]

セッションID	コンテンツID	端末ID	起動時間	通信速度	再生開始時刻
S01	C01	R01			
S01	C01	R02			
S01	C01	R03			
⋮	⋮	⋮	⋮	⋮	⋮

[図6]



[図7]

セッションID	コンテンツID	端末ID	起動時間	通信速度	再生開始時刻
S01	C01	R01	1200	3	
S01	C01	R02	1000	50	
S01	C01	R03			
⋮	⋮	⋮	⋮	⋮	⋮

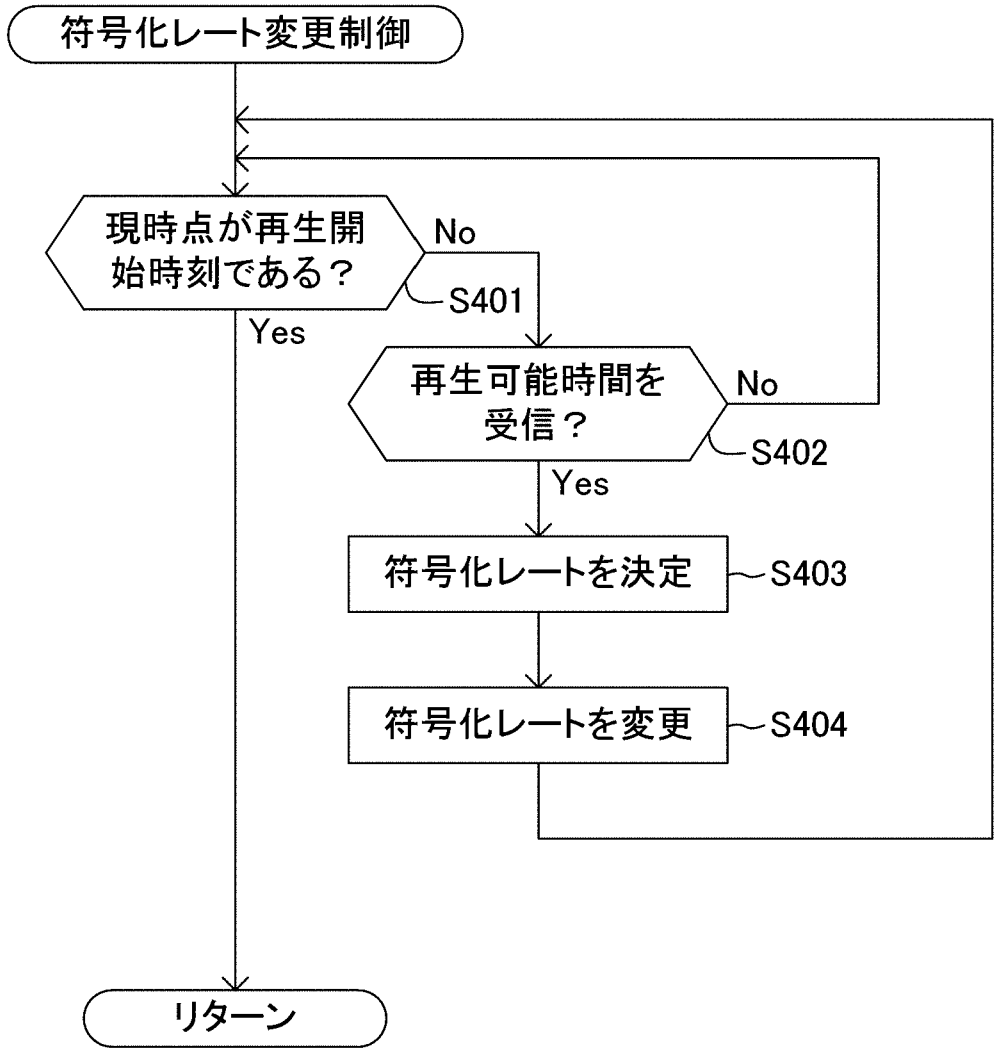
[図8]

セッションID	コンテンツID	端末ID	起動時間	通信速度	再生開始時刻
S01	C01	R01	1200	3	13:01:34
S01	C01	R02	1000	50	13:01:34
S01	C01	R03			
⋮	⋮	⋮	⋮	⋮	⋮

[図9]

セッションID	端末ID	再生可能時間	残余時間	符号化レート
S01	R01	0	31	2
S01	R02	0	31	50
⋮	⋮	⋮	⋮	⋮

[図10]



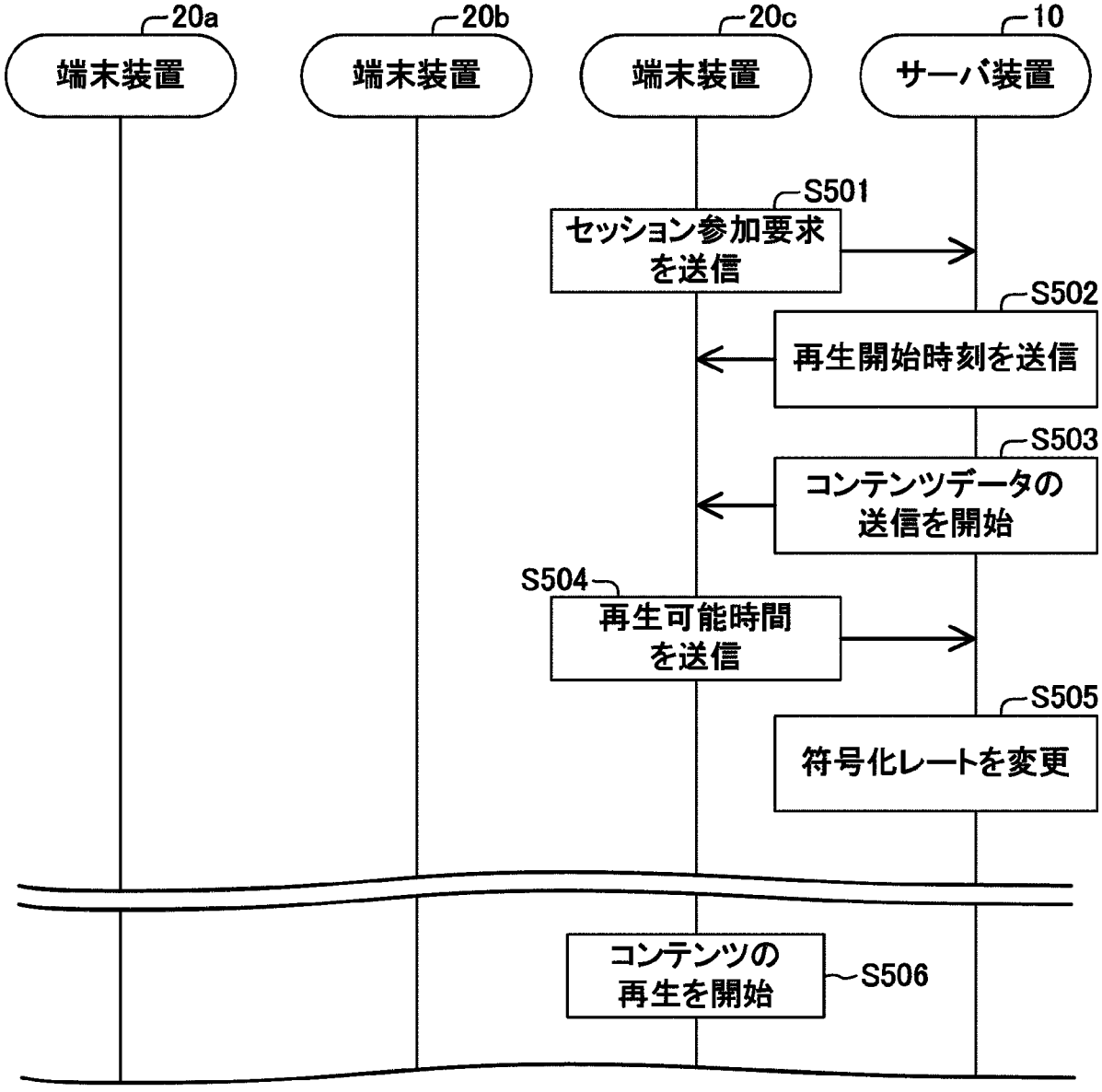
[図11]

セッションID	端末ID	再生可能時間	残余時間	符号化レート
S01	R01	0	31	2
S01	R02	0	31	50
S01	R01	7	26	2
S01	R02	2	26	16
⋮	⋮	⋮	⋮	⋮

[図12]

セッションID	端末ID	再生可能時間	残余時間	符号化レート
S01	R01	0	31	2
S01	R02	0	31	50
S01	R01	7	26	2
S01	R02	2	26	16
S01	R01	18	21	4
S01	R02	14	21	50
⋮	⋮	⋮	⋮	⋮

[図13]



[図14]

セッションID	コンテンツID	端末ID	起動時間	通信速度	再生開始時刻
S01	C01	R01	1200	3	13:01:34
S01	C01	R02	1000	50	13:01:34
S01	C01	R03	1500	8	
⋮	⋮	⋮	⋮	⋮	⋮

[図15]

セッションID	コンテンツID	端末ID	起動時間	通信速度	再生開始時刻
S01	C01	R01	1200	3	13:01:34
S01	C01	R02	1000	50	13:01:34
S01	C01	R03	1500	8	13:05:25
⋮	⋮	⋮	⋮	⋮	⋮

[図16]

