Electronic Acknowledgement Receipt

EFS ID:	43015004
Application Number:	17121919
International Application Number:	
Confirmation Number:	2764
Title of Invention:	ELECTRONIC TOOL AND METHODS FOR MEETINGS
First Named Inventor/Applicant Name:	Koen Simon Herman BEEL
Customer Number:	23364
Filer:	Thomas Lee/Yanling Cottle
Filer Authorized By:	Thomas Lee
Attorney Docket Number:	BEEL3002CIPC2/TJM
Receipt Date:	17-JUN-2021
Filing Date:	15-DEC-2020
Time Stamp:	12:45:09
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	POA_0039.pdf	502444 9b570ff4c5199a1e91e532a6cd5a4b30644850a3	no	2

Warnings:

Information:	
Total Files Size (in bytes):	502444

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17121919
Filing Date	2020-12-15
First Named Inventor	Koen Simon Herman BEEL
Art Unit	TBD
Examiner Name	TBD
Attorney Docket Number	BEEL3002CIPC2/TJM

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17121919
	Filing Date	2020-12-15
	First Named Inventor	Koen Simon Herman BEEL
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	BEEL3002CIPC2/TJM

	1	Summons To Attend Oral Proceedings in corresponding European Application No. 12762258.7, dated May 20, 2021.	

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17121919
	Filing Date	2020-12-15
	First Named Inventor	Koen Simon Herman BEEL
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	BEEL3002CIPC2/TJM

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Thomas J. Moore/	Date (YYYY-MM-DD)	2021-05-28
Name/Print	THOMAS J. MOORE	Registration Number	28974

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	42834597
Application Number:	17121919
International Application Number:	
Confirmation Number:	2764
Title of Invention:	ELECTRONIC TOOL AND METHODS FOR MEETINGS
First Named Inventor/Applicant Name:	Koen Simon Herman BEEL
Customer Number:	23364
Filer:	Thomas J. Moore/Shelly Darrenkamp
Filer Authorized By:	Thomas J. Moore
Attorney Docket Number:	BEEL3002CIPC2/TL
Receipt Date:	28-MAY-2021
Filing Date:	15-DEC-2020
Time Stamp:	08:12:37
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	BEEL3002CIPC2_ids.pdf	1034391 42377cb298a8ef4bd17518e642afc51b15a659e1	no	4

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A U.S. Patent Number Citation or a U.S. Publication Number Citation is required in the Information Disclosure Statement (IDS) form for autoloading of data into USPTO systems. You may remove the form to add the required data in order to correct the Informational Message if you are citing U.S. References. If you chose not to include U.S. References, the image of the form will be processed and be made available within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.					
2	Non Patent Literature	Summonsattendoralproceedings_20May2021.pdf	3806026 a4cbac9591e7978bff2b1b60596e82dd2ad2d236	no	72
Warnings:					
Information:					
			Total Files Size (in bytes):	4840417	

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New International Application Filed with the USPTO as a Receiving Office

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17121919
Filing Date	2020-12-15
First Named Inventor	Koen Simon Herman BEEL
Art Unit	TBD
Examiner Name	TBD
Attorney Docket Number	BEEL3002CIPC2/TL

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	7853535	B2	2010-12-14	Colella	
	2	7908401	B2	2011-03-15	Chang	

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U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20060080707	A1	2006-04-13	Laksono	
	2	20100149206	A1	2010-06-17	Shigehisa et al.	

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FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	1525300	CN	A	2004-09-01	Microsoft Corp.	Abstract.	X

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17121919
	Filing Date	2020-12-15
	First Named Inventor	Koen Simon Herman BEEL
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	BEEL3002CIPC2/TL

	2	1555197	CN	A	2004-12-15	Shenzhen Postgraduate Inst Tsi	Abstract.	☒
	3	101046952	CN	A	2007-10-03	Kei Nakayama	Abstract.	☒
	4	101075896	CN	A	2007-11-21	Polycom Inc.	Abstract.	☒
	5	102025774	CN	A	2011-04-20	TPV Display Technology Xiamen	Abstract.	☒
	6	102088593	CN	A	2011-06-08			☒
	7	2007148904	JP	A	2007-06-14	Toshiba Corp	Abstract.	☒
	8	201012222	TW	A	2010-03-16	Primax Electronics Ltd	Abstract.	☒

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	Chinese Office Action in corresponding Chinese Application No. 201810229467.1, dated April 7, 2020.	✕
	2	Chinese Office Action in corresponding Chinese Application No. 201811092577.4, dated April 7, 2020.	☒

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17121919
	Filing Date	2020-12-15
	First Named Inventor	Koen Simon Herman BEEL
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	BEEL3002CIPC2/TL

EXAMINER SIGNATURE			
Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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	Application Number	17121919
	Filing Date	2020-12-15
	First Named Inventor	Koen Simon Herman BEEL
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	BEEL3002CIPC2/TL

CERTIFICATION STATEMENT

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See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Thomas Lee/	Date (YYYY-MM-DD)	2021-05-21
Name/Print	THOMAS LEE	Registration Number	66396

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	42776075
Application Number:	17121919
International Application Number:	
Confirmation Number:	2764
Title of Invention:	ELECTRONIC TOOL AND METHODS FOR MEETINGS
First Named Inventor/Applicant Name:	Koen Simon Herman BEEL
Customer Number:	23364
Filer:	Thomas Lee/Shelly Darrenkamp
Filer Authorized By:	Thomas Lee
Attorney Docket Number:	BEEL3002CIPC2/TL
Receipt Date:	21-MAY-2021
Filing Date:	15-DEC-2020
Time Stamp:	07:32:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	BEEL3002CIPC2_IDS_Transmittal_Ltr.pdf	26147 20b3603b4b91c2235614f1c7d6d69038b9e98deb	no	2

Warnings:

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	BEEL3002CIPC2_IDS_SB08_Part 1.pdf	616273 889d97e912902f00dac480a64f53a297e3c6ec43	no	13
Warnings:					
Information:					
3	Information Disclosure Statement (IDS) Form (SB08)	BEEL3002CIPC2_ids_Sb08_part 2.pdf	1038387 05191f0d31608e98cd47604871a5c12c182011fc	no	13
Warnings:					
Information:					
4	Information Disclosure Statement (IDS) Form (SB08)	BEEL3002CIPC2_ids_sb08_part 3.pdf	1035147 2a9913b40c88dce2b74c434a33868fb32bd099a4	no	5
Warnings:					
Information:					
		Total Files Size (in bytes):	2715954		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Continuation Patent Application of:
U.S. App. No. 14/725,401

Application No.:	**17/121,919**	**Confirm. No.:**	**2764**
Filing Date:	**December 15, 2020**	**Art Unit:**	**TBD**
First Inventor:	**Koen Simon Herman BEEL**	**Customer No.:**	**23364**
Attorney No.:	**BEEL3002CIPC2/TL**	**Examiner:**	**TBD**
For:	**ELECTRONIC TOOL AND METHODS FOR MEETINGS**		

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

INTRODUCTORY COMMENTS

Pursuant to Rule 37 C.F.R. §§ 1.51(b), 1.56, 1.97 and 1.98, this Information Disclosure Statement is submitted in the above-identified patent application. A listing of documents to be published on the face of any patent granted from this application is submitted herewith on the attached form PTO/SB/08A. Any other documents or information submitted for consideration by the Examiner are listed on the attached forms. Copies of the references are not provided as they are of record in the parent Application Nos. 14/725,401, 14/212,170, and 13/270,659 (*see* MPEP 609.02).

This Information Disclosure Statement is submitted before the mailing of a first Office action on the merits. No fees are required.

The Examiner is requested to acknowledge consideration of the information provided in this paper in accordance with prescribed procedures.

BACON & THOMAS, PLLC
625 Slaters Lane, Fourth Floor
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Respectfully submitted,

/Thomas Lee/

Date: May 21, 2021

THOMAS LEE
Attorney for Applicant
Registration No. 66,396

PTO/SB/08a (02-18)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	17121919
Filing Date	2020-12-15
First Named Inventor	Koen Simon Herman BEEL
Art Unit	TBD
Examiner Name	TBD
Attorney Docket Number	BEEL3002CIPC2/TL

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	6601087		2003-07-29	Zhu et al.	
	2	7584313		2009-09-01	Hay et al.	
	3	7762470		2010-07-27	Finn et al.	
	4	8069465		2011-11-29	Bartholomay et al.	
	5	8327410		2012-12-04	Andersen et al.	
	6	8521926		2013-08-27	Hsueh et al.	
	7	8601470		2013-12-03	Yue et al.	
	8	8717599		2014-05-06	Ochiai et al.	

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	9	8896656		2014-11-25	Epstein et al.	

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	1	20030120849		2003-06-26	Roslak et al.	
	2	20060233191		2006-10-19	Pirzada et al.	
	3	20070162661		2007-07-12	Fu et al.	
	4	20080088634		2008-04-17	Thompson et al.	
	5	20080182518		2008-07-31	Lo	
	6	20090023475		2009-01-22	Chang et al.	
	7	20090029647		2009-01-29	Wei et al.	
	8	20090251621		2009-10-08	Ichieda	

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	9	20100022274		2010-01-28	Roberts et al.	
	10	20100077021		2010-03-25	Hsueh et al.	
	11	20100091987		2010-04-15	Takahashi et al.	
	12	20100115145		2010-05-06	Banerjee et al.	
	13	20100154014		2010-06-17	Andersen et al.	
	14	20100297964		2010-11-25	Austin et al.	
	15	20100309896		2010-12-09	Sugiyama et al.	
	16	20110010470		2011-01-13	Hulbert et al.	
	17	20110010607		2011-01-13	Raveendran	
	18	20110038005		2011-02-17	Ochiai et al.	
	19	20110210983		2011-09-01	Theimer et al.	

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	20	20110179182	A1	2011-07-21	VADLA RAVNAS	
	21	20050015719	A1	2005-01-20	MARCHON et al.	
	22	20090092198	A1	2011-04-21	Miyata	
	23	20050122392	A1	2005-06-09	Johansen et al.	
	24	20090300520	A1	2009-12-03	Ashutosh et al.	
	25	20120054372		2012-03-01	Chen et al.	
	26	20090189981		2009-07-30	Siann et al.	
	27	20110188391		2011-08-04	Sella et al.	
	28	20100064063		2010-03-11	Deforche et al.	
	29	20110092198		2011-04-21	Miyata	
	30	20060010116		2006-01-12	Yaguchi et al.	

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	31	20070168481		2007-07-19	Lambert et al.	
	32	20020054044		2002-05-09	Lu et al.	

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	1	2006-185359	JP		2006-07-13	Eastman Kodak Co.	English Abstract	
	2	2009-080663	JP		2009-04-16	Brother Ind Ltd.	English Abstract	
	3	2010-263326	JP		2010-11-18	Sumitomo Electric Ind.	English Abstract	
	4	2010/008866	WO		2010-01-21	Schaaf		
	5	2008-090561	JP		2008-04-17	BROTHER IND LTD	cited in EP Search Report, English abstract & mach translation	
	6	1329055	EP		2003-07-23	SONY CORP	cited in EP Search Report, corresponds to WO 01/089156	
	7	1476242	CN		2004-02-18	SEIKO EPSON CORP	English abstract of corresponding EP 1385336, cited in CN OA	

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	8	2010/105335	WO		2010-09-23	SMART TECHNOLOGIES ULC	cited in CN OA	
	9	102045864	CN		2011-05-04	NEC CASIO MOBILE COMM LTD	English abstract (Corresponds U.S. 2011/0092198), cited in CN OA	
	10	101631223	CN		2011-04-20	SHANGHAI HUAPING INFORMATION TECHNOLOGY CO LTD	Cited in CN OA dated 10-10-16, English abstract	
	11	101454762	CN		2013-06-12	SMART TECHNOLOGIES ULC	Cited in CN OA dated 10-10-16, English abstract	
	12	1550996	CN		2004-12-01	SEIKO EPSON CORP	Cited in CN OA dated 10-14-16, English abstract	
	13	101965609	CN		2011-02-02	SMART TECHNOLOGIES ULC	Cited in CN OA dated 10-14-16, English abstract	
	14	1385336	EP		2004-01-28	SEIKO EPSON CORP		
	15	2013037979	WO		2013-03-21	Barco N.V.		
	16	2008165007	JP		2008-07-17	Brother Ind Ltd		☒
	17	2000242257	JP		2000-09-08	Canon KK		☒
	18	102045864	CN		2011-05-04	NEC Casio Mobile Comm Ltd.	English abstract	☐

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	19	2010/135894	WO		2010-12-02	ZTE Corporation	English Abstract	☒

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	'Universal Serial Bus 3.0 Specification", Revision 1.0 Nov. 12, 2008.	
	2	'Wireless Universal Serial Bus Specification 1.1", Revision 1.1 September 9, 2010.	
	3	AUSTIN et al., "Determinants and Patterns of Control over Technology in a Computerized Meeting Room," CSCW 90 Proceedings, pp. 39-51 (Oct. 1990).	
	4	ROTH, "Building Group Decision Support Rooms Using 'Off-the-Shelf' Computing Resources: Prospects and Issues," Database, pp. 21-31 (May 1993).	
	5	GRAY, et al., "The User Interface in Group Decision Support Systems," Group Support Systems: New Perspectives, Ch. 10, Macmillan Publishing Company, New York (1993).	
	6	Products, components, systems, and methods in public use and/or sale related to the Epson Quick Wireless Connection USB key and Quick Wireless Connection , developed by Epson (accessed July 7, 2017)	
	7	Products, components, systems, and methods in public use and/or sale related to the IOGEAR GUW2015VKIT Wireless USB to VGA Adapter Kit, developed by IOGEAR (accessed July 17, 2017).	
	8	Products, components, systems, and methods in public use and/or sale related to the ActionTec MyWirelessTV HDMI Transmitter, developed by ActionTec and Cavium (accessed Feb. 3, 2020).	

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	9	European Search Report dated August 1, 2017, for EP 16207123.	
	10	European Extended Search Report dated November 3, 2016, for EP 16170760.9.	
	11	Chinese Office Action dated October 14, 2016, for CN 201280055744.2.	
	12	Chinese Office Action dated October 10, 2016, for CN 201280055667.0.	
	13	Final Office Action in corresponding U.S. app. 14/395,364 dated November 2, 2016.	
	14	Office Action in related U.S. app. 14/725,401 dated December 31, 2019.	
	15	Summons to attend oral proceedings in corresponding EP 12762258.7 dated December 12, 2019.	
	16	Chinese Office Action in corresponding Chinese Application No. 201280074077.2, dated September 30, 2019.	
	17	U.S. Office Action in corresponding U.S. Application No. 14/278,442, dated September 18, 2019.	
	18	Notice on Reexamination in corresponding Chinese Application No. 201280001542.X, dated June 11, 2019.	X
	19	European Office Action in corresponding European Application No. 12759440.6-1204, dated May 28, 2019.	☐

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	20	U.S. Office Action in corresponding U.S. Application No. 15/449,048, dated April 8, 2019.	☐
	21	European Office Action in corresponding European Application No. 12775162.6-1204, dated May 21, 2019.	☐
	22	Chinese Office Action in corresponding Chinese Application No. 201280074077.2, dated March 5, 2019.	☐
	23	European Office Action in corresponding European Application No. 16170760.9-1216, dated April 2, 2019.	☐
	24	Non-Final Office Action in corresponding U.S. Reexamination No. 90/014,088, dated September 25, 2018.	☐
	25	Final Office Action in corresponding U.S. Reexamination No. 90/014,087, dated January 22, 2019.	☐
	26	Chinese Office Action in related Chinese Application No. 201280001542.X, dated January 2, 2019.	☒
	27	https://www.infocus.com/resources/documents/User-Guides/Liteshow-3-UserGuide.pdf, accessed October 3, 2018.	☐
	28	http://esupport.epson-europe.com/ViewArticle.aspx?lng=sv-SE&kbid=328038&data=bOU002FRlftu7YFtMOBp2mpSKntPq1A26Wyw&cl=1, accessed July 8, 2017.	☐
	29	SIPO Office Action in corresponding app. CN 201280074077.2 dated August 23, 2018.	☒
	30	Office Action in corresponding app. 15/449,048 dated October 12, 2018.	☐

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	31	SIPO Office Action in corresponding app. CN 201280001542.X dated July 30, 2018.	☒
	32	EPO Office Action in corresponding app. EP 12759440.6-1204 dated August 9, 2018.	☐
	33	EPO Office Action in corresponding app. EP 12775162.6-1204 dated August 9, 2018.	☐
	34	Office Action in corresponding app. 14/725,401 dated September 10, 2018.	☐
	35	Office Action in corresponding app. 90/014,087 dated September 4, 2018.	☐
	36	Office Action in corresponding app. 16/034,846 dated October 7, 2019.	☐
	37	Office Action in corresponding app. 14/344,830 dated September 28, 2017.	☐
	38	Office Action in corresponding app. 14/344,830 dated October 6, 2016.	☐
	39	European Office Action in corresponding European Application No. 16207123.7, dated November 23, 2020.	☐
	40	U.S. Office Action in corresponding U.S. Application No. 16/852,790, dated October 08, 2020.	☐
	41	LINQ SOFTWARE USER'S GUIDE, Smart Technologies Inc., Copyright 2004-2005, Version 1.0, pages 1-19.	☐

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	42	Chinese Notice on Reexamination in corresponding Chinese Application No. 201280074077.2, dated March 31, 2020.	☒
	43	European Office Action in corresponding European Application No. 12775162.6, dated April 14, 2020.	☐
	44	Brazil Office Action in corresponding Brazil Application No. BR112014026147-4, dated April 8, 2020.	☒
	45	Brazil Office Action in corresponding Brazil Application No. BR122015022158-7, dated April 8, 2020.	☒
	46	U.S. Office Action in corresponding Application No. 16/034,846, dated June 25, 2020.	☐

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Thomas Lee/	Date (YYYY-MM-DD)	2021-05-21
Name/Print	THOMAS LEE	Registration Number	66396

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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	1	6966035	B1	2005-11-15	Suess et al.	Cited in Specification
	2	8316138	B2	2012-11-20	Chang	
	3	8346753	B2	2013-01-01	HAYES	

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	1	20100087139	A1	2010-04-08	Glass	Cited in Specification and German Search Report
	2	20060095376	A1	2006-05-04	Mitchell et al.	Cited in Specification
	3	20090198839	A1	2009-08-06	Banerjee et al.	Cited in Specification

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	4	20110115689	A1	2011-05-19	Sugiyama et al.	Cited in Specification
	5	20020196378	A1	2002-12-26	Slobodin et al.	Cited in Specification
	6	20130067121	A1	2013-05-14	Beel et al.	Related U.S. App. 13/270,659
	7	20130050254	A1	2013-02-28	Tran et al.	
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	9	20070005809	A1	2007-01-04	Kobayashi et al.	
	10	20100302130	A1	2010-12-02	Kikuchi et al.	
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	15	20090046139	A1	2009-02-19	Cutler et al.	
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	18	20140082227	A1	2014-03-20	BEEL et al.	
	19	20040125777	A1	2004-07-01	Doyle et al.	
	20	20070065078	A1	2007-03-22	Jiang	
	21	20090247006	A1	2009-10-01	Thompson	
	22	20130054348	A1	2013-02-28	Holsman et al.	
	23	20100302454	A1	2010-12-02	EPSTEIN et al.	
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	25	20130060662	A1	2013-03-07	CARLSON et al.	

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	28	20090235170	A1	2009-09-17	GOLDEN et al.	
	29	20040128354	A1	2004-07-01	HORIKIRI et al.	corresponds to CN 1499841
	30	20100066806	A1	2010-03-18	LYU	
	31	20070109410	A1	2007-05-17	SIEW	
	32	20110150433	A1	2011-06-23	ALEXANDROV et al.	
	33	20110180380	A1	2011-07-28	Lee	
	34	20020174254	A1	2002-11-21	KITA et al.	corresponds to CN 1689275

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17121919
	Filing Date	2020-12-15
	First Named Inventor	Koen Simon Herman BEEL
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	BEEL3002CIPC2/TL

	1	00/52887	WO	A1	2000-09-08	MICROSOFT CORPORATION		
	2	1246395	EP	A1	2002-10-02	MOTOROLA, INC.		
	3	1187480	EP	A1	2002-03-13	TELESUITE CORP.		
	4	2001/089156	WO	A2	2001-11-22	SONY CORP		
	5	2008/271265	JP	A	2008-11-06	MATSUSHITA ELECTRIC IND CO LTD	English abstract and translation	X
	6	2107463	EP	A2	2009-10-07	OPTION		☐
	7	2756668	EP	A	2014-07-23	BARCO NV	corresponds to WO 2013/037979	☐
	8	1499841	CN	A	2004-05-26	FUJI XEIOX CO LTD	cited in CN OA, corresponds to US 20040128354	☒
	9	101106681	CN	A	2008-01-16	VTRON CORP	cited in CN OA, English machine translation	☒
	10	1788494	CN	A	2006-06-14	TELESUIT CORP	cited in CN OA, English abstract	☒
	11	101022529	CN	A	2007-08-22	LIXING INTERNAT SCIENCE & TECH	cited in CN OA, English abstract	☒

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	12	101106469	CN	A	2008-01-16	AWIND INC	cited in CN OA, English abstract	☒
	13	101442500	CN	A	2009-05-27	XIAOTAO YIN	cited in CN OA, English abstract	☒
	14	101828392	CN	A	2010-09-08	CREATIVE TECH LTD	cited in CN OA, English abstract	☒
	15	102023852	CN	A	2011-04-20	JULONG EDUCATIONAL TECHNOLOGY CO LTD	cited in CN OA, English abstract	☒
	16	1689275	CN	A	2005-10-26	SONY CORP	English abstract, corresponds to US 20020174254	☒
	17	2007/137415	WO	A1	2007-12-06	SMART TECH INC	cited in EP Office Communication	☐

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	1	International Search Report (ISR) dated March 6, 2013, for PCT/EP2012/068166.	
	2	International Search Report (ISR) dated March 19, 2013, for PCT/EP2012/068167.	
	3	International Search Report (ISR) dated March 4, 2013, for PCT/EP2012/068168.	

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	4	International Search Report (ISR) dated January 28, 2013, for PCT/EP2012/068169.	
	5	British Search Report dated August 28, 2012, for GB 1206841.7.	
	6	German Search Report dated November 17, 2011, for DE 102011055443.2.	
	7	Jiang et al., "A Novel Wireless Approach for Conference Projecting and Cooperating", Lecture Notes in Computer Science, Vol. 4159, pp. 688-697, 2006. (cited in GB 1206841.7 Search Report)	
	8	Martin Trautschold, iPhone 4 Made Simple, 2010, Apress, Pages 1-819.	
	9	Office Action in related U.S. Application Number 15/449,048, dated February 16, 2018.	
	10	US Office Action dated March 29, 2016, for 14/395,364.	
	11	Marc AL-HAMES et al., Audio-Visual Processing in Meetings: Seven Questions and Current AMI Answers, 2006.	
	12	Mood indicators on electronic meeting tools" IBM, IP.com number: IPCOMOOOO1171D, Publication Date: March 12, 2003.	
	13	Final Office Action in related U.S. Application No. 14/278,442, dated June 8, 2018.	
	14	Office Action in related Chinese Application Number 201280055744.2, dated March 30, 2018.	X

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	15	Office Action in related U.S. Application Number 14/344,836, dated February 28, 2018.	☐
	16	U.S. Office Action dated October 20, 2017, for U.S. Application No. 14/344,836.	☐
	17	European Notice of Opposition dated September 27, 2017 for EP 2756668.	☐
	18	StarTech.com: USB to DVI External Dual Monitor Video Adapter/USS to VGA External Dual Monitor Video Adapter, User Manual dated May 19, 2011.	☐
	19	Microsoft Community, conversation on August 30, 2011 about USB2VGA Adapter, retrieved on September 7, 2017.	☐
	20	Webopedia Definition of Peripheral Device, retrieved on September 7, 2017.	☐
	21	Trulink Wireless USB2VGA Adapter, Quick Start Guide, retrieved from www.c2g.com.	☐
	22	HWebPage on Availability of Trulink, retrieved on September 7, 2017.	☐
	23	Chinese Office Action dated October 31, 2017, for CN 201280001542.X, and English translation thereof.	☐
	24	European Office Communication dated June 15, 2015, for EP 12762258.7.	☐
	25	European Office Action dated August 1, 2016, for EP 12762258.7.	☐

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	26	U.S. Office Action dated June 17, 2016, for 14/278,442.	☐
	27	U.S. Office Action dated June 17, 2016, for 14/725,401.	☐
	28	Chinese Office Action dated April 5, 2017, for CN 201280055744.2, and English translation thereof.	☐
	29	U.S. Office Action dated May 3, 2017, for U.S. Application No. 14/344,836.	☐
	30	Chinese Office Action dated September 26, 2017, for CN 201280055744.2, and English translation thereof.	☒
	31	U.S. Office Action dated September 28, 2017, for U.S. Application No. 14/278,442.	☐
	32	"Quick Connect Wireless with Epson Projectors", retrieved from https://www.youtube.com/watch?v=9POz4-HyDXY, November 3, 2009.	☐
	33	"Remote Framebuffer Protocol (RFB)", Internet standard IETF RFC 6143 , March 2011.	☐
	34	Richardson & Wood, "The RFB Protocol", Cambridge: ORL, 1998.	☐
	35	"Manual of the Epson projectors", retrieved from http://esupport.epsoneurope.com/ViewArticle.aspx?lng=sv-SE&kbid=328038&data=bOU002FRIftu7YFtMOBp2mpSKntPq1A26Wyw&cl=1, February 14, 2011.	☐
	36	Chinese Office Action dated December 27, 2016, for CN 201280074077.2, and English translation thereof.	☐

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	37	Final Office Action in corresponding U.S. App. 14/725,401 dated January 26, 2017.	☐
	38	Final Office Action in corresponding U.S. App. 14/278,442 dated January 26, 2017.	☐
	39	Chinese Office Action in Chinese Application Number 201280074077.2, dated January 4, 2018.	☒
	40	International Preliminary Report on Patentability (IPRP) dated March 27, 2014, for PCT/EP2012/068166.	☐
	41	International Preliminary Report on Patentability (IPRP) dated March 27, 2014, for PCT/EP2012/068167.	☐
	42	International Preliminary Report on Patentability (IPRP) dated March 27, 2014, for PCT/EP2012/068168.	☐
	43	Request for Reexamination of Patent No. 8,756,348, dated February 9, 2018.	☐
	44	Request for Reexamination of Patent No. 9,083,769, dated February 9, 2018.	☐
	45	Intervention according to Art. 105 EPC in corresponding European patent 2756668, dated May 3, 2018.	☐
	46	Chinese Office Action dated November 4, 2016, for CN 201280001542.X, and English translation thereof.	☐
	47	European Office Communication dated December 21, 2015, for EP 12762258.7.	☐

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	48	Chinese Office Action dated June 28, 2017, for CN 201280074077.2, and English translation thereof.	☒
	49	Chinese Office Action dated July 4, 2017, for CN 201280055667.0, and English translation thereof.	☒
	50	Chinese Office Action dated July 21, 2017, for CN 20128001542.X, and English translation thereof.	☒

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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Thomas Lee/	Date (YYYY-MM-DD)	2021-05-21
Name/Print	THOMAS LEE	Registration Number	66396

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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	2	20070033289	A1	2007-02-08	Nuyttens et al.	
	3	20110222556	A1	2011-09-15	Shefler et al.	

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	1	2010135894	WO	A1	2010-12-02	ZTE Corporation	Abstract.	X

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2010 年 12 月 2 日 (02.12.2010)

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(10) 国际公布号
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G06F 3/16 (2006.01) *H04W 88/02* (2009.01)

(21) 国际申请号: PCT/CN2009/075508

(22) 国际申请日: 2009 年 12 月 11 日 (11.12.2009)

(25) 申请语言: 中文

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(30) 优先权:
200910085521.0 2009 年 5 月 25 日 (25.05.2009) CN

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(54) **Title**: METHOD AND DEVICE FOR TRANSMITTING UNIVERSAL SERIAL BUS AUDIO DATA THROUGH A WIRELESS DATA TERMINAL

(54) **发明名称** : 无线数据终端通用串行总线音频数据传输的方法及装置

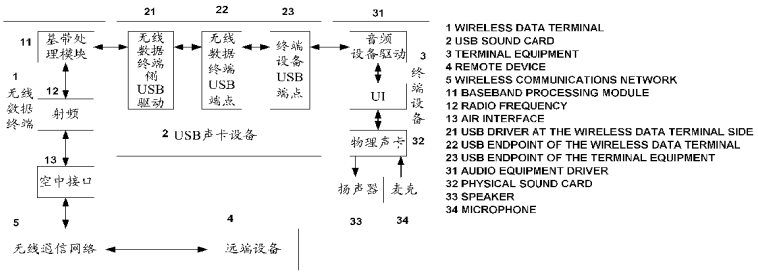


图 3 / Fig. 3

(57) **Abstract**: A method and device for transmitting universal serial bus (USB) audio data through a wireless data terminal are provided. The method enumerates an USB audio data transmission channel between a wireless data terminal and a terminal equipment into an USB sound card that adopts the USB AUDIO CLASS standard as defined by the USB specifications, so as to transmit audio data; the device includes a wireless data terminal, an USB sound card, and a terminal equipment. The USB sound card only transmits audio data, and does not process audio data; the USB audio equipment driver of the terminal equipment accesses the USB endpoint of the terminal equipment in the same manner of accessing a sound card interface. The present method and device specifically optimize USB audio data transmission channels, and fully utilize the powerful capability of terminal equipments, thereby enhancing the effectiveness of voice over USB (VOUSB) in practical application.

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(57) 摘要:

公开了一种实现无线数据终端通用串行总线音频数据传输的方法及装置。其方法为将无线数据终端与终端设备之间的ＵＳＢ音频数据传输通道，采用ＵＳＢ规范定义的标准的ＵＳＢ　ＡＵＤＩＯ　ＣＬＡＳＳ枚举成一个ＵＳＢ声卡设备，传输音频数据；该装置包括无线数据终端、ＵＳＢ声卡设备、终端设备。所述ＵＳＢ声卡设备仅传输音频数据，而不对音频数据进行处理；终端设备的ＵＳＢ音频设备驱动以访问声卡设备接口的方式访问终端设备ＵＳＢ端点。采用本发明的方法及装置，对ＵＳＢ音频数据传输通道进行专门优化，充分利用终端设备处理音频数据的强大能力，增强了 VOUSB 的实际应用效果。

无线数据终端通用串行总线音频数据传输的方法及装置

技术领域

本发明涉及音频数据传输技术，具体涉及一种实现无线数据终端通用串行总线音频数据传输的方法及装置。

背景技术

目前，时分同步的码分多址（TD-SCDMA，Time Division-Synchronous Code Division Multiple Access）技术作为中国提出的第三代移动通信标准已经日趋成熟，在 TD-SCDMA 技术支持下，从网络下载数据和向网络上传数据的速度都得到了极大的提高，而速度的提高又必然会促进用户对音频业务和视频业务需求的增加。

目前，无线数据终端在处理音频数据时，对从空口接收到的模拟音频信号，直接送到相应的射频、编解码器等硬件设备进行解调、解码，最后由扬声器播放；对麦克采集的需要发送的模拟音频信号，在相应的编解码器、射频等硬件设备进行编码、调制后发送出去。这种处理音频数据方式存在的缺陷在于：由于需要对音频数据进行编码和解码，无线数据终端就必须配有相应的编解码器，增加了硬件成本。

为克服上述音频数据处理方式存在的缺陷，目前比较流行的实现方法是通用串行总线音频传输（VOUSB，Voice Over USB），下面以广泛应用的 PC 作为终端设备为例对该方法的实现作简单说明。无线数据终端将解调后的音频数据通过通用串行总线（USB，Universal Serial BUS）接口传输到 PC 进行解码等处理；类似地，将在 PC 中完成编码等处理的音频数据通过 USB 接口传输到无线数据终端。这样，无线数据终端在硬件上就不再需要编解码器，降低了硬件成本。而且，相对于无线数据终端，PC 具有更强的

计算能力和更多的内存资源，因此对音频数据具有更强大的处理能力，能够进行更加丰富的处理，如能够进行去噪、润饰、混音等处理。

图 1 为现有技术中 VOUSB 的实现方案示意图，如图 1 所示，无线数据终端的空中接口接收远端设备经无线通信网络发来的模拟音频信号，并传输到射频进行解调，之后，由基带处理模块对解调后的音频数据进行放大和数字滤波处理，得到脉冲编码调制（PCM，Pulse Code Modulation） 码流，再将 PCM 码流传输到无线数据终端侧 USB 驱动，由该无线数据终端侧 USB 驱动将 PCM 码流传输到无线数据终端的 USB 端点，最后，按照 USB 标准的批量传输方式，PCM 码流经无线数据终端的 USB 端点传输到终端设备的 USB 端点。这里，无线数据终端侧 USB 驱动的作用是从基带处理模块接收音频数据并传输到无线数据终端的 USB 端点，或从无线数据终端的 USB 端点读出音频数据并传输到基带处理模块。所述 USB 标准的批量传输方式的特点是支持在不确定的时间内进行大量的数据传输，能够保证数据一定可以正确传输，但不保证传输的带宽和延时，因此数据传输的实时性不好。另外，对于以 USB 标准的批量传输方式传输的音频数据，终端设备没有标准设备驱动对其进行处理，如果需要对该音频数据进行处理，就需要借助于应用程序用户接口（UI，User Interface）来实现，其实现过程如下：

对无线数据终端发送到终端设备的 USB 端点的 PCM 码流，终端设备侧 USB 驱动将其读出，并进一步由终端设备的 UI 从终端设备侧 USB 驱动读取并处理，之后，将 PCM 码流传输到物理声卡。物理声卡对传输来的 PCM 码流进行解码，再经 A/D 转换等处理得到模拟音频信号，最后将模拟音频信号送至扬声器播放。所述物理声卡可以为外设组件互连（PCI，Peripheral Component Interconnect）接口的声卡或 USB 声卡等。这里，终端设备侧 USB 驱动的作用是从终端设备 USB 端点读出音频数据传输到 UI，

或从 UI 获取音频数据传输到终端设备的 USB 端点。

基于以上描述可见，VOUSB 的实现方案中，无线数据终端与终端设备之间的 USB 音频数据传输通道仅仅是作为数据的传输通道，这样带来的问题是没有针对音频数据传输的特点做专门的优化，在实时性等方面影响了 VOUSB 的实际应用效果。

发明内容

有鉴于此，本发明的主要目的在于提供一种实现无线数据终端通用串行总线音频数据传输的方法及装置，充分利用终端设备处理音频数据的强大能力，增强 VOUSB 的实际应用效果。

为解决上述技术问题，本发明的技术方案是这样实现的:

一种实现无线数据终端通用串行总线音频数据传输的方法，将无线数据终端和终端设备之间的通用串行总线（USB）音频数据传输通道枚举为 USB 声卡设备，该方法包括:

无线数据终端通过所述 USB 声卡设备向终端设备发送音频数据，终端设备通过自身的音频设备驱动访问所述 USB 声卡设备获取音频数据;

终端设备通过自身的音频设备驱动向所述 USB 声卡设备发送音频数据，无线数据终端通过所述 USB 声卡设备接收该音频数据。

所述将无线数据终端和终端设备之间的 USB 音频数据传输通道枚举为 USB 声卡设备，包括:

无线数据终端将传输音频数据的无线数据终端 USB 端点定义为声卡，并将该无线数据终端 USB 端点通过 USB 数据线连接到终端设备 USB 端点;

终端设备向无线数据终端请求获取所连接声卡的设备描述符、配置描述符、描述符集合，无线数据终端收到请求后，向终端设备发送设备描述符、配置描述符、描述符集合;

终端设备根据获取的设备描述符、配置描述符、描述符集合确定能够

提供 USB 的驱动后，加载相应符合 USB 规范的音频设备驱动，由音频设备驱动对声卡进行配置，得到 USB 声卡设备。

所述终端设备包括音频设备驱动、用户接口（UI）和物理声卡，

所述终端设备通过自身的音频设备驱动访问 USB 声卡设备获取音频数据，包括：音频设备驱动以访问 USB 声卡设备接口的方式访问所述 USB 声卡设备，对传输到 USB 声卡设备的脉冲编码调制（PCM）码流进行读取和释放；UI 通过音频设备接口访问音频设备驱动，将 PCM 码流传输到物理声卡。

所述终端设备包括音频设备驱动、UI 和物理声卡，

所述终端设备通过自身的音频设备驱动向 USB 声卡设备发送音频数据，包括：物理声卡由模拟音频信号得到 PCM 码流；UI 从物理声卡获取该 PCM 码流，并通过音频设备驱动的音频设备接口将 PCM 码流传输到音频设备驱动，音频设备驱动向 USB 声卡设备发送 PCM 码流。

所述无线数据终端通过 USB 声卡设备向终端设备发送音频数据，包括：无线数据终端的基带处理模块将处理得到的 PCM 码流传输到所述 USB 声卡设备的无线数据终端侧 USB 驱动。

所述无线数据终端通过 USB 声卡设备接收音频数据，包括：无线数据终端的基带处理模块通过所述 USB 声卡设备的无线数据终端侧 USB 驱动获取传输到无线数据终端 USB 端点的 PCM 码流。

一种实现无线数据终端通用串行总线音频数据传输的装置，包括：

无线数据终端，用于通过 USB 声卡设备向终端设备发送音频数据，还用于通过 USB 声卡设备接收来自终端设备的音频数据。

将无线数据终端和终端设备之间的 USB 音频数据传输通道枚举为 USB 声卡设备，用于在无线数据终端和终端设备之间传输音频数据；

终端设备，用于通过自身的音频设备驱动访问 USB 声卡设备获取来自

无线数据终端的音频数据，还用于通过自身的音频设备驱动向 USB 声卡设备发送音频数据。

所述 USB 声卡设备包括：无线数据终端侧 USB 驱动、无线数据终端 USB 端点和终端设备 USB 端点，

所述无线数据终端侧 USB 驱动与无线数据终端的基带处理模块相连；

所述无线数据终端 USB 端点通过 USB 数据线与终端设备 USB 端点相连；

所述终端设备 USB 端点与终端设备的音频设备驱动相连。

所述终端设备用于通过自身的音频设备驱动访问 USB 声卡设备获取来自无线数据终端的音频数据时，所述终端设备包括：

音频设备驱动，用于以访问 USB 声卡设备接口的方式访问所述终端设备 USB 端点，对传输到终端设备 USB 端点的 PCM 码流进行读取和释放；

UI，用于通过音频设备接口访问音频设备驱动，将 PCM 码流传输到物理声卡；

物理声卡，用于由 PCM 码流得到模拟音频信号。

所述终端设备用于通过自身的音频设备驱动向 USB 声卡设备发送音频数据时，所述终端设备包括：

物理声卡，用于由模拟音频信号得到 PCM 码流；

UI，用于从物理声卡获取该 PCM 码流，并通过音频设备驱动的音频设备接口将 PCM 码流传输到音频设备驱动；

音频设备驱动，用于向所述终端设备 USB 端点发送 PCM 码流。

由此可见，相比现有技术而言，本发明中提供的一种实现无线数据终端通用串行总线音频数据传输的方法及装置，针对音频数据传输的特点，对 USB 音频数据传输通道进行抽象和优化，充分利用终端设备处理音频数据的强大能力，增强了 VOUSB 的实际应用效果。

另外，本发明方案还具有以下特点和优点：

首先，将无线数据终端和终端设备之间的 USB 音频数据传输通道，采用 USB 规范定义的标准的 USB AUDIO CLASS 枚举成一个 USB 声卡设备来传输音频数据，而广泛使用的终端设备上的操作系统都默认地提供了符合 USB 规范的音频设备驱动的实现，因此，音频设备驱动以访问 USB 声卡设备接口的方式访问终端设备的 USB 端点；音频设备驱动对从 USB 端点读取的音频数据进行读取和释放。

其次，采用 USB 标准的同步传输方式传输音频数据具有很好的实时性，且终端设备具有针对该同步传输方式的标准驱动，即音频设备驱动，对终端设备 USB 端点的音频数据的读取和释放都是在音频设备驱动中完成，其处理优先级高于在应用程序 UI 中处理，因此，在终端设备的操作系统负载很重时，音频数据的处理依然具有非常好的实时性。

最后，UI 通过音频设备接口来访问音频设备驱动，将完成释放的音频数据传输到物理声卡。由于 UI 是通过音频设备接口来访问音频设备驱动，降低了 UI 对音频设备驱动的依赖；音频设备接口是标准接口，无需关注底层音频设备驱动实现的细节，且操作系统可移植性好，使 UI 实现起来更加简单、可靠。

附图说明

图 1 为现有技术中 VOUSB 的实现方案示意图；

图 2 为本发明中实现无线数据终端通用串行总线音频数据传输的装置结构示意图；

图 3 为本发明中将 USB 音频数据传输通道抽象成 USB 声卡设备的示意图；

图 4 为本发明中无线数据终端作为音频数据接收方的传输流程图；

图 5 为本发明中无线数据终端作为音频数据发送方的传输流程图。

具体实施方式

下面结合附图及具体实施例对本发明再作进一步详细的说明。

本发明中提供一种实现无线数据终端通用串行总线音频数据传输的装置，如图 2 所示，该装置主要由无线数据终端、USB 声卡设备、以及终端设备组成。其中，

无线数据终端，用于通过 USB 声卡设备向终端设备发送音频数据，还用于通过 USB 声卡设备接收来自终端设备的音频数据；

将无线数据终端和终端设备之间的 USB 音频数据传输通道枚举为 USB 声卡设备，用于在无线数据终端和终端设备之间传输音频数据；

终端设备，用于通过自身的音频设备驱动访问 USB 声卡设备来获取来自无线数据终端的音频数据，还用于通过自身的音频设备驱动向 USB 声卡设备发送音频数据。

具体地，终端设备的音频设备驱动以访问 USB 声卡设备接口的方式访问终端设备 USB 端点，对传输到该终端设备 USB 端点的音频数据进行读取和释放，之后，进一步由 UI 将音频数据传输到物理声卡进行解码、D/A 转换，最后由扬声器播放；对麦克采集、并进一步由物理声卡进行 A/D 转换、编码的音频数据，由 UI 传输到音频设备驱动进行压缩，之后，由音频设备驱动以访问 USB 声卡设备接口的方式回传到终端设备 USB 端点。

图 3 为本发明中将 USB 音频数据传输通道抽象成 USB 声卡设备的示意图，如图 3 所示，对比图 1，本发明中，根据 USB 规范中 USB 声卡应用方法将无线数据终端与终端设备之间的 USB 音频数据传输通道抽象成一个 USB 声卡设备。所述 USB 音频数据传输通道指：无线数据终端侧 USB 驱动、无线数据终端的 USB 端点、终端设备的 USB 端点、以及两个 USB 端点之间的 USB 数据线在内的音频数据传输通道。实现将 USB 音频数据传输通道抽象成一个 USB 声卡设备的关键在于：将 USB 音频数据传输通道，采

用 USB 规范定义的标准的 USB AUDIO CLASS 枚举成一个 USB 声卡设备。所述枚举通过以下步骤来实现：首先，无线数据终端侧将传输音频数据的无线数据终端 USB 端点定义为一个声卡，并将该无线数据终端 USB 端点通过 USB 数据线连接到终端设备 USB 端点；之后，终端设备向无线数据终端发送请求，请求获取所连接声卡的设备描述符、配置描述符、描述符集合等信息；无线数据终端在收到请求后，向终端设备发送所请求的设备描述符、配置描述符、描述符集合等信息；然后，终端设备在获取这些信息并根据这些信息确定能够提供 USB 的驱动以后，加载相应符合 USB 规范的音频设备驱动；最后，终端设备在得到各种描述符之后，认为所连接的声卡的信息已经齐全，便由音频设备驱动对声卡进行配置，配置成功即可实现无线数据终端与终端设备之间的音频数据传输。至此，枚举过程结束，完成了将 USB 音频数据传输通道枚举成 USB 声卡设备。无线数据终端与 USB 声卡设备的无线数据终端侧 USB 驱动相连接；终端设备与 USB 声卡设备的终端设备 USB 端点相连接。

不同于通常的 USB 声卡等物理声卡所具有的音频数据处理能力，以及能够将处理后的音频数据直接送到扬声器播放的处理能力，该 USB 声卡设备的特点是具有与物理声卡相同的访问接口和使用方式，对用户而言可以将 USB 声卡设备视作一个实际的物理声卡，但实际上，这个 USB 声卡设备只具有音频数据传输功能，而没有真实的音频数据处理能力，如果还需要对收到的音频数据进行处理，就需要借助于终端设备上的物理声卡来实现。对于终端设备发送到无线数据终端的音频数据，无线数据终端将通过无线通信网络传输到远端设备。所述远端设备可以为无线数据终端或终端设备。如果远端设备还要对收到的音频数据进行处理，对于远端设备是终端设备的情况，直接借助该终端设备上的物理声卡处理音频数据后播放；对于远端设备是无线数据终端的情况，将接收到的音频数据传输到与该无

线数据终端通过 USB 声卡设备相连的终端设备，借助于该终端设备上的物理声卡处理音频数据后播放。

由于将无线数据终端和终端设备之间的 USB 音频数据传输通道，采用 USB 规范定义的标准的 USB AUDIO CLASS 枚举成一个 USB 声卡设备，来实现音频数据传输，而广泛使用的终端设备上的操作系统都默认地提供了符合 USB 规范的音频设备驱动的实现，因此，对于由无线数据终端发送到 USB 声卡设备的终端设备 USB 端点的音频数据，音频设备驱动以访问 USB 声卡设备接口的方式访问该终端设备 USB 端点；音频设备驱动在访问终端设备 USB 端点时，对发送到该终端设备 USB 端点的音频数据进行读取和释放，相对于现有的由应用程序 UI 读取和释放音频数据，由音频设备驱动进行读取和释放优先级更高，因此，即使在终端设备的操作系统负载很重时，音频数据的处理依然具有很好的实时性；音频设备驱动除了向下访问终端设备 USB 端点，向上还可提供音频设备接口，该音频设备接口是标准接口，UI 访问该音频设备接口时，无需关注底层的音频设备驱动实现的细节，且操作系统可移植性好，UI 可通过音频设备接口访问音频设备驱动并将音频数据传送到物理声卡，减少了 UI 对音频设备驱动的依赖，使 UI 实现起来更加简单、可靠。

具体地，终端设备通过 USB 声卡设备获取音频数据时，音频设备驱动用于以访问 USB 声卡设备接口的方式访问所述终端设备 USB 端点，对传输到终端设备 USB 端点的 PCM 码流进行读取和释放；UI，用于通过音频设备接口访问音频设备驱动，将 PCM 码流传输到物理声卡；物理声卡，用于由 PCM 码流得到模拟音频信号。

终端设备通过 USB 声卡设备发送音频数据时，物理声卡用于由模拟音频信号得到 PCM 码流；UI 用于从物理声卡获取该 PCM 码流，并通过音频设备驱动的音频设备接口将 PCM 码流传输到音频设备驱动；音频设备驱动

用于向所述终端设备 USB 端点发送 PCM 码流。

利用 USB 声卡设备实现音频数据传输的过程如图 4、图 5 所示。

图 4 为无线数据终端作为音频数据接收方的传输流程图，如图 4 所示，音频数据的传输包括以下步骤:

步骤 401: 无线数据终端的空中接口接收远端设备经无线通信网络发来的模拟音频信号，并传送到射频等硬件进行解调，之后，由基带处理模块对解调后的音频数据进行放大和数字滤波处理，得到 PCM 码流。

步骤 402: 处理后得到的 PCM 码流由无线数据终端的基带处理模块传输到 USB 声卡设备的无线数据终端侧 USB 驱动; 之后，按照 USB 标准的同步传输方式，PCM 码流经无线数据终端 USB 端点和 USB 数据线被传输到 USB 声卡设备的终端设备 USB 端点。

步骤 403: 在 PCM 码流传输到终端设备 USB 端点之后，终端设备的音频设备驱动以访问 USB 声卡设备接口的方式访问该终端设备 USB 端点，并对传输到终端设备 USB 端点的 PCM 码流进行读取和释放，之后，UI 通过音频设备接口访问音频设备驱动，将 PCM 码流传输到物理声卡。

步骤 404: 物理声卡对传送来的 PCM 码流进行解码、D/A 转换等处理后得到模拟音频信号，最后，将该模拟音频信号传输到扬声器播放。

图 5 为无线数据终端作为音频数据发送方的传输流程图，如图 5 所示，音频数据的传输包括以下步骤:

步骤 501: 终端设备的麦克将采集的模拟音频信号传送到物理声卡，由物理声卡对其进行 A/D 转换、编码等处理，得到 PCM 码流形式的数字音频信号。

步骤 502: 终端设备的 UI 从物理声卡获取 PCM 码流，并通过音频设备驱动的音频设备接口将 PCM 码流传输到音频设备驱动，由音频设备驱动对 PCM 码流进行压缩，之后，音频设备驱动以访问 USB 声卡设备接口的

方式将 PCM 码流回传到 USB 声卡设备的终端设备 USB 端点。

步骤 503：在 PCM 码流传输到 USB 声卡设备的终端设备 USB 端点之后，按照 USB 标准的同步传输方式， PCM 码流经 USB 数据线传输到 USB 声卡设备的无线数据终端 USB 端点。

步骤 504：无线数据终端的基带处理模块通过无线数据终端侧 USB 驱动获取传输到无线数据终端 USB 端点的 PCM 码流，进行放大和数字滤波处理，再经射频进行调制，得到模拟音频信号，最后，由空中接口经无线通信网络发送到远端设备。

以上所述，仅为本发明的较佳实施例而已，并非用于限定本发明的保护范围。

权利要求书

1、一种实现无线数据终端通用串行总线音频数据传输的方法，其特征在于，将无线数据终端和终端设备之间的通用串行总线（USB）音频数据传输通道枚举为 USB 声卡设备，该方法包括:

无线数据终端通过所述 USB 声卡设备向终端设备发送音频数据，终端设备通过自身的音频设备驱动访问所述 USB 声卡设备获取音频数据;

终端设备通过自身的音频设备驱动向所述 USB 声卡设备发送音频数据，无线数据终端通过所述 USB 声卡设备接收该音频数据。

2、根据权利要求 1 所述的方法，其特征在于，所述将无线数据终端和终端设备之间的 USB 音频数据传输通道枚举为 USB 声卡设备，包括:

无线数据终端将传输音频数据的无线数据终端 USB 端点定义为声卡，并将该无线数据终端 USB 端点通过 USB 数据线连接到终端设备 USB 端点;

终端设备向无线数据终端请求获取所连接声卡的设备描述符、配置描述符、描述符集合，无线数据终端收到请求后，向终端设备发送设备描述符、配置描述符、描述符集合;

终端设备根据获取的设备描述符、配置描述符、描述符集合确定能够提供 USB 的驱动后，加载相应符合 USB 规范的音频设备驱动，由音频设备驱动对声卡进行配置，得到 USB 声卡设备。

3、根据权利要求 1 所述的方法，其特征在于，所述终端设备包括音频设备驱动、用户接口（UI）和物理声卡，

所述终端设备通过自身的音频设备驱动访问 USB 声卡设备获取音频数据，包括: 音频设备驱动以访问 USB 声卡设备接口的方式访问所述 USB 声卡设备，对传输到 USB 声卡设备的脉冲编码调制（PCM）码流进行读取和释放; UI 通过音频设备接口访问音频设备驱动，将 PCM 码流传输到物理声卡。

4、根据权利要求 1 所述的方法，其特征在于，所述终端设备包括音频设备驱动、UI 和物理声卡，

所述终端设备通过自身的音频设备驱动向 USB 声卡设备发送音频数据，包括：物理声卡由模拟音频信号得到 PCM 码流；UI 从物理声卡获取该 PCM 码流，并通过音频设备驱动的音频设备接口将 PCM 码流传输到音频设备驱动，音频设备驱动向 USB 声卡设备发送 PCM 码流。

5、根据权利要求 1 至 4 任一所述的方法，其特征在于，所述无线数据终端通过 USB 声卡设备向终端设备发送音频数据，包括：无线数据终端的基带处理模块将处理得到的 PCM 码流传输到所述 USB 声卡设备的无线数据终端侧 USB 驱动。

6、根据权利要求 1 至 4 任一所述的方法，其特征在于，所述无线数据终端通过 USB 声卡设备接收音频数据，包括：无线数据终端的基带处理模块通过所述 USB 声卡设备的无线数据终端侧 USB 驱动获取传输到无线数据终端 USB 端点的 PCM 码流。

7、一种实现无线数据终端通用串行总线音频数据传输的装置，其特征在于，包括：

无线数据终端，用于通过 USB 声卡设备向终端设备发送音频数据，还用于通过 USB 声卡设备接收来自终端设备的音频数据。

将无线数据终端和终端设备之间的 USB 音频数据传输通道枚举为 USB 声卡设备，用于在无线数据终端和终端设备之间传输音频数据；

终端设备，用于通过自身的音频设备驱动访问 USB 声卡设备获取来自无线数据终端的音频数据，还用于通过自身的音频设备驱动向 USB 声卡设备发送音频数据。

8、根据权利要求 7 所述的装置，其特征在于，所述 USB 声卡设备包括：无线数据终端侧 USB 驱动、无线数据终端 USB 端点和终端设备 USB

端点，

所述无线数据终端侧 USB 驱动与无线数据终端的基带处理模块相连；

所述无线数据终端 USB 端点通过 USB 数据线与终端设备 USB 端点相连；

所述终端设备 USB 端点与终端设备的音频设备驱动相连。

9、根据权利要求 8 所述的装置，其特征在于，所述终端设备用于通过自身的音频设备驱动访问 USB 声卡设备获取来自无线数据终端的音频数据时，所述终端设备包括:

音频设备驱动，用于以访问 USB 声卡设备接口的方式访问所述终端设备 USB 端点，对传输到终端设备 USB 端点的 PCM 码流进行读取和释放;

UI，用于通过音频设备接口访问音频设备驱动，将 PCM 码流传输到物理声卡;

物理声卡，用于由 PCM 码流得到模拟音频信号。

10、根据权利要求 8 所述的装置，其特征在于，所述终端设备用于通过自身的音频设备驱动向 USB 声卡设备发送音频数据时，所述终端设备包括:

物理声卡，用于由模拟音频信号得到 PCM 码流;

UI，用于从物理声卡获取该 PCM 码流，并通过音频设备驱动的音频设备接口将 PCM 码流传输到音频设备驱动;

音频设备驱动，用于向所述终端设备 USB 端点发送 PCM 码流。

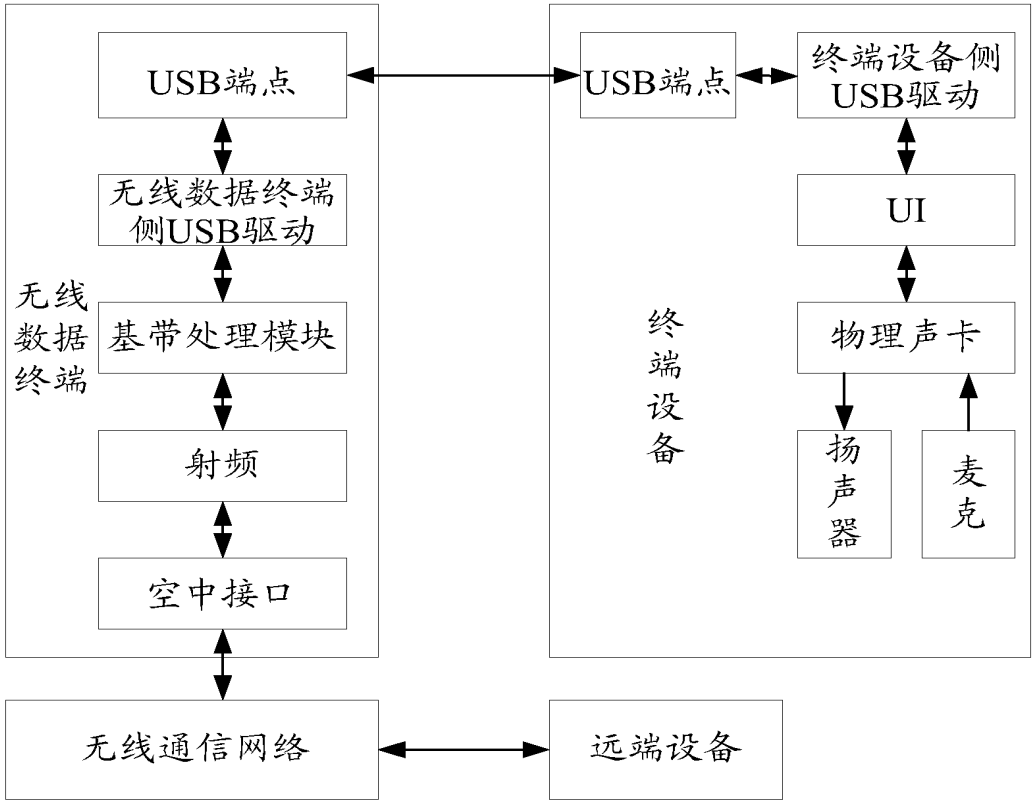

USB端点
无线数据终端侧USB驱动
无线数据终端
基带处理模块
射频
空中接口
USB端点
终端设备侧USB驱动
UI
终端设备
物理声卡
扬声器
麦克
无线通信网络
远端设备

图 1


无线数据终端
USB声卡设备
终端设备

图 2

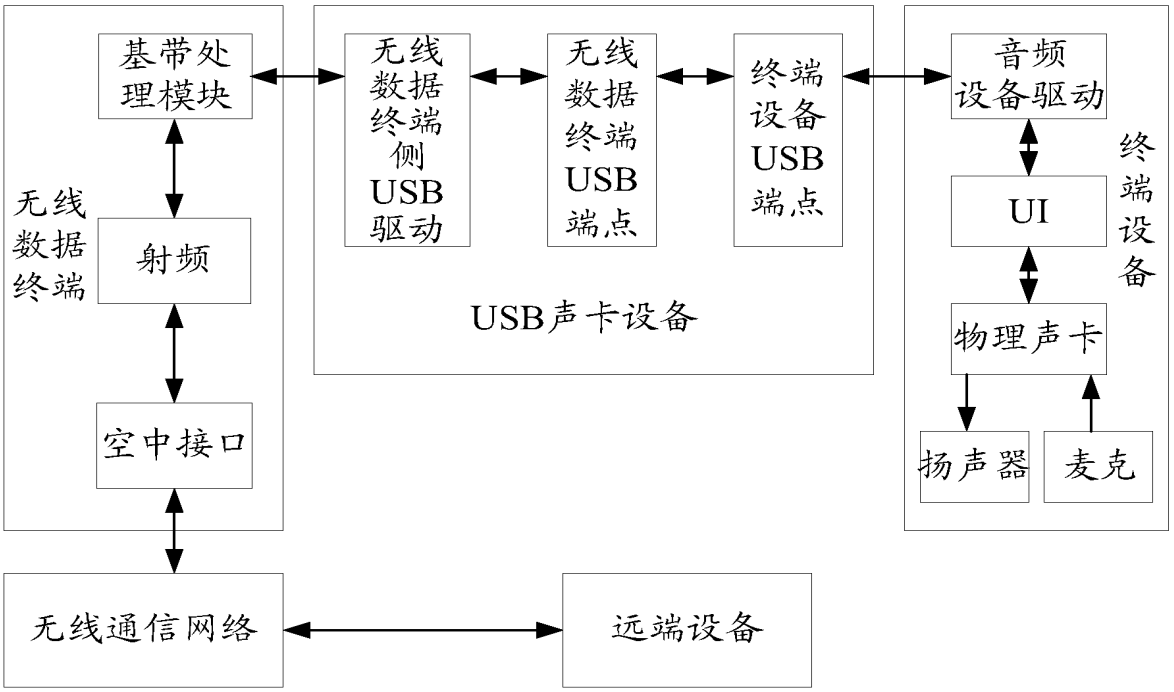

基带处理模块
射频
空中接口
无线数据终端
无线通信网络
无线数据终端侧USB驱动
无线数据终端USB端点
终端设备USB端点
USB声卡设备
音频设备驱动
UI
物理声卡
扬声器
麦克
终端设备
远端设备

图 3

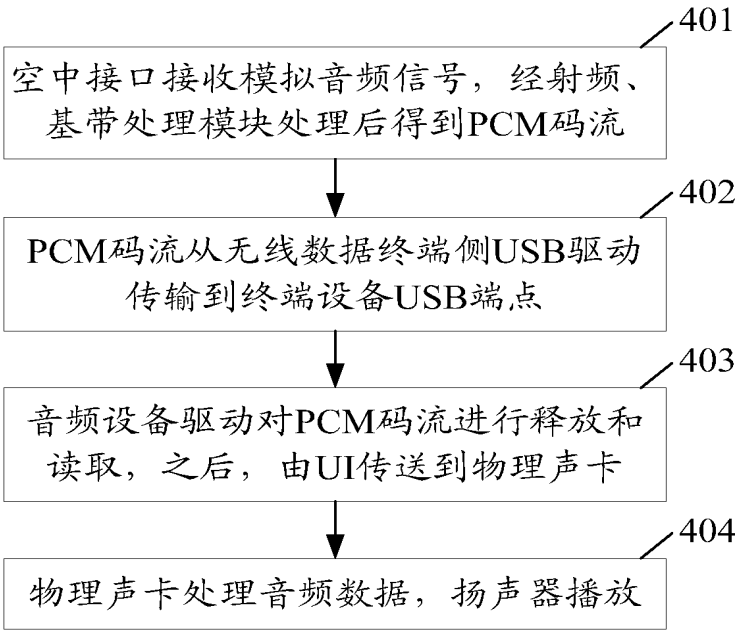

401
空中接口接收模拟音频信号，经射频、基带处理模块处理后得到PCM码流
402
PCM码流从无线数据终端侧USB驱动传输到终端设备USB端点
403
音频设备驱动对PCM码流进行释放和读取，之后，由UI传送到物理声卡
404
物理声卡处理音频数据，扬声器播放

图 4

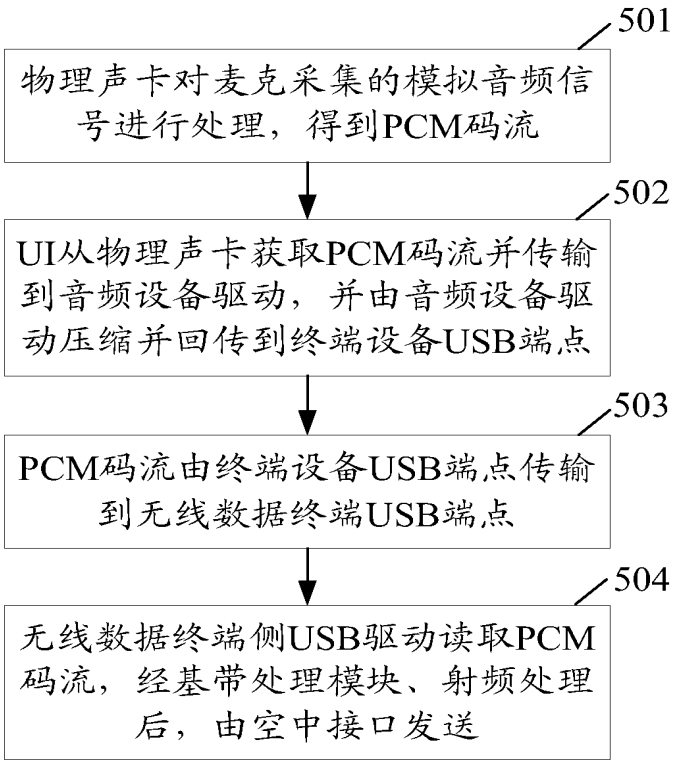

501
物理声卡对麦克采集的模拟音频信号进行处理，得到PCM码流
502
UI从物理声卡获取PCM码流并传输到音频设备驱动，并由音频设备驱动压缩并回传到终端设备USB端点
503
PCM码流由终端设备USB端点传输到无线数据终端USB端点
504
无线数据终端侧USB驱动读取PCM码流，经基带处理模块、射频处理后，由空中接口发送

图 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2009/075508

A. CLASSIFICATION OF SUBJECT MATTER

see the extra sheet

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)

IPC: G06F3/-; H04W; G06F13/-; H04B1/-; H04M; H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNPAT,CNKI,WPI,EPODOC,PAJ: USB, wireless+, audio, card, universal, serial, bus, voice, transmit+, transmission, terminal, channel, driv+, own, access+, code, stream, PCM, interface, radio, frequency

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, X	CN101566940A, (ZHONGXING COMMUNICATION CO LTD SHENZHEN), 28 Oct. 2009(28.10.2009), the whole document	1-10
Y	CN200950579Y, (LI Y), 19 Sep. 2007(19.09.2007), the description page 1 line 11 to page 4 line 1, and figures 1-2	1, 7
A		2-6, 8-10
Y	US20080104289A1, (D-BOX TECHNOLOGIES INC et al.), 01 May 2008(01.05.2008), the description paragraphs 37-44 and figure 3	1, 7
A		2-6, 8-10
A	CN101212750A, (LEJIN ELECTRONICS CHINA RES & DEV CENT), 02 Jul. 2008(02.07.2008), the whole document	1-10

☐ 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
01 Mar. 2010(01.03.2010)	**11 Mar. 2010 (11.03.2010)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer ZHAO, Xiaoning Telephone No. (86-10)62412071

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2009/075508

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN101566940A	28.10.2009	none	
CN200950579Y	19.09.2007	none	
US20080104289A1	01.05.2008	WO2008049217A1	02.05.2008
		KR20090074260A	06.07.2009
		EP2092518 A1	26.08.2009
		CN101611443A	23.12.2009
		CA2667575A1	02.05.2008
CN101212750A	02.07.2008	none	

Form PCT/ISA /210 (patent family annex) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2009/075508

CLASSIFICATION OF SUBJECT MATTER

G06F3/16(2006.01) i
H04W88/02(2009.01) i

Form PCT/ISA /210 (extra sheet) (July 2009)

国际检索报告

国际申请号
PCT/CN2009/075508

A. 主题的分类

参见附加页

按照国际专利分类(IPC)或者同时按照国家分类和 IPC 两种分类

B. 检索领域

检索的最低限度文献(标明分类系统和分类号)

IPC: G06F3/-; H04W; G06F13/-; H04B1/-; H04M; H04Q

包含在检索领域中的除最低限度文献以外的检索文献

在国际检索时查阅的电子数据库(数据库的名称，和使用的检索词（如使用）) CNPAT,CNKI,WPI,EPODOC,PAJ

无线，声卡，音频，USB，传输，传送，终端，通用，串行，总线，声音，通道，驱动，自身，访问，端点，码流，PCM，接口，射频

wireless+, audio, card, universal, serial, bus, voice, transmit+, transmission, terminal, channel, driv+, own, access+, code, stream, PCM, interface, radio, frequency

C. 相关文件

类　型*	引用文件，必要时，指明相关段落	相关的权利要求
P, X	CN101566940A，(中兴通讯股份有限公司)，28.10 月 2009(28.10.2009)，全文	1-10
Y	CN200950579Y，(李宇波)，19.9 月 2007(19.09.2007)，说明书第 1 页第 11 行—第 4 页第 1 行及附图 1-2	1, 7
A		2-6, 8-10
Y	US20080104289A1，(D-BOX TECHNOLOGIES INC 等)，01.5 月 2008(01.05.2008)，说明书第 37-44 段及附图 3	1, 7
A		2-6, 8-10
A	CN101212750A，(乐金电子（中国）研究开发中心有限公司)，02.7 月 2008(02.07.2008)，全文	1-10

☐ 其余文件在 C 栏的续页中列出。　　☒ 见同族专利附件。

* 引用文件的具体类型：

"A" 认为不特别相关的表示了现有技术一般状态的文件

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"L" 可能对优先权要求构成怀疑的文件，或为确定另一篇引用文件的公布日而引用的或者因其他特殊理由而引用的文件（如具体说明的）

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"T" 在申请日或优先权日之后公布，与申请不相抵触，但为了理解发明之理论或原理的在后文件

"X" 特别相关的文件，单独考虑该文件，认定要求保护的发明不是新颖的或不具有创造性

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"&" 同族专利的文件

国际检索实际完成的日期	国际检索报告邮寄日期
01.3 月 2010(01.03.2010)	**11.3 月 2010 (11.03.2010)**
ISA/CN 的名称和邮寄地址： 中华人民共和国国家知识产权局 中国北京市海淀区蓟门桥西土城路 6 号 100088 传真号：　(86-10)62019451	受权官员 赵小宁 电话号码：(86-10) **62412071**

国际检索报告
关于同族专利的信息

国际申请号
PCT/CN2009/075508

检索报告中引用的专利文件	公布日期	同族专利	公布日期
CN101566940A	28.10.2009	无	
CN200950579Y	19.09.2007	无	
US20080104289A1	01.05.2008	WO2008049217A1	02.05.2008
		KR20090074260A	06.07.2009
		EP2092518 A1	26.08.2009
		CN101611443A	23.12.2009
		CA2667575A1	02.05.2008
CN101212750A	02.07.2008	无	

主题的分类

G06F3/16(2006.01) i

H04W88/02(2009.01) i

Electronic Acknowledgement Receipt

EFS ID:	42513457
Application Number:	17121919
International Application Number:	
Confirmation Number:	2764
Title of Invention:	ELECTRONIC TOOL AND METHODS FOR MEETINGS
First Named Inventor/Applicant Name:	Koen Simon Herman BEEL
Customer Number:	23364
Filer:	Thomas Lee/Shelly Darrenkamp
Filer Authorized By:	Thomas Lee
Attorney Docket Number:	BEEL3002CIPC2/TL
Receipt Date:	22-APR-2021
Filing Date:	15-DEC-2020
Time Stamp:	07:34:38
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	BEEL3002CIPC2_IDS.pdf	1034581 085e1481576dd57dda2c422717b51225f895a33c	no	4

Warnings:

Information:					
2	Non Patent Literature	EP_OA4_19Apr2021.pdf	638990 a90f485694db254ccb175b811deb1022df013cb3	no	15
Warnings:					
Information:					
3	Foreign Reference	WO2010135894A1.pdf	1123396 89d46a9711f28b0f35124e5e8416fba9d5ac36ca	no	25
Warnings:					
Information:					
			Total Files Size (in bytes):	2796967	

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

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PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17121919
Filing Date	2020-12-15
First Named Inventor	Koen Simon Herman BEEL
Art Unit	TBD
Examiner Name	TBD
Attorney Docket Number	BEEL3002CIPC2/TL

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20100079783	A1	2010-04-01	Naganuma et al.	
	2	20050036509	A1	2005-02-17	Acharya et al.	
	3	20060010116	A1	2006-01-12	Yaguchi et al.	
	4	20070168481	A1	2007-07-19	Lambert et al.	

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17121919
	Filing Date	2020-12-15
	First Named Inventor	Koen Simon Herman BEEL
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	BEEL3002CIPC2/TL

	1	1187480	EP	A1	2002-03-13	TeleSuite Corporation		
	2	1462998	EP	A2	2004-09-29	Microsoft Corporation		

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	European Search Report in corresponding European Application No. 20212054.9, dated April 7, 2021.	
	2	European Office Action in corresponding European Application No. 16207123.7, dated November 23, 2020.	
	3	U.S. Office Action in corresponding U.S. Application No. 16/852,790, dated October 08, 2020.	

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17121919
	Filing Date	2020-12-15
	First Named Inventor	Koen Simon Herman BEEL
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	BEEL3002CIPC2/TL

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Thomas Lee/	Date (YYYY-MM-DD)	2021-04-07
Name/Print	THOMAS LEE	Registration Number	66396

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	42385631
Application Number:	17121919
International Application Number:	
Confirmation Number:	2764
Title of Invention:	ELECTRONIC TOOL AND METHODS FOR MEETINGS
First Named Inventor/Applicant Name:	Koen Simon Herman BEEL
Customer Number:	23364
Filer:	Thomas Lee/Shelly Darrenkamp
Filer Authorized By:	Thomas Lee
Attorney Docket Number:	BEEL3002CIPC2/TL
Receipt Date:	07-APR-2021
Filing Date:	15-DEC-2020
Time Stamp:	09:25:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Foreign Reference	EP1187480A1.pdf	1879462 d263422cc3acbf4cb99d3dab262059aa4ffd3be0	no	30

Warnings:

Information:					
2	Foreign Reference	EP1462998A2.pdf	3272703 27854a80eb58b3698861270b932ed5eaf0e57ba2	no	78
Warnings:					
Information:					
3	Non Patent Literature	ESR_7Apr2021.pdf	472421 6364ec0674c847addf72eab2c2b761059460f494	no	12
Warnings:					
Information:					
4	Information Disclosure Statement (IDS) Form (SB08)	BEEL3002CIPC2_IDS.pdf	1034719 b428c21b4e4874d7f38d7f32f80b8c35ab3a4510	no	4
Warnings:					
Information:					
5	Non Patent Literature	EP_OA1_23Nov2020.pdf	165432 6239cd66902edc853324ab2f165eb137311b4451	no	5
Warnings:					
Information:					
6	Non Patent Literature	US_OA1_8Oct2020.pdf	4556095 502601b304969d88cc9c15193a454bfb92b06e13	no	118
Warnings:					
Information:					
		Total Files Size (in bytes):	11380832		

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New Applications Under 35 U.S.C. 111

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National Stage of an International Application under 35 U.S.C. 371

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New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 187 480 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
13.03.2002 Bulletin 2002/11

(51) Int Cl.[7]: **H04N 7/15**

(21) Application number: **01128723.2**

(22) Date of filing: **18.09.1995**

(84) Designated Contracting States:
AT BE CH DE ES FR GB GR IE IT LI NL PT SE

(30) Priority: **19.09.1994 US 308603**

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
95933837.7 / 0 806 115

(71) Applicant: **TeleSuite Corporation**
Englewood, Ohio 45322 (US)

(72) Inventors:
- **Allen, David Lee**
Arcanum, Ohio 45304 (US)
- **Williams, Herold**
Huber Heights, Ohio 45424 (US)

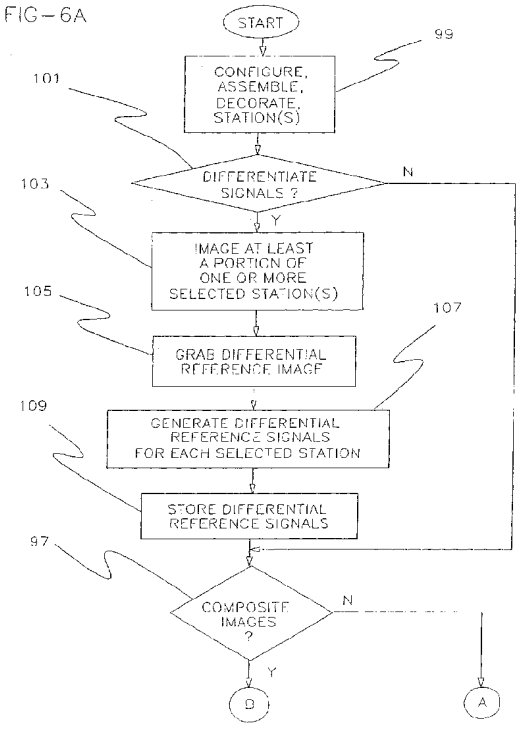
(74) Representative: **Vollmann, Heiko, Dipl.-Ing. et al**
Patentanwälte Wilcken & Vollmann,
Bei der Lohmühle 23
23554 Lübeck (DE)

Remarks:
This application was filed on 03 - 12 - 2001 as a divisional application to the application mentioned under INID code 62.

(54) Teleconferencing method and system

(57) A method and system (10) provides a face-to-face video conference utilizing a video mirror comprising a first station (12) having a first predetermined sensory setting; at least a second station (14) having a second sensory setting; the second station being remote from the first station; and an imaging system for capturing an image or sub-image at the first station, displaying at least a portion of said image or sub-image at the first station. The imaging system includes a differentiator for generating a differential signal (101) in response to a comparison of a differential referecnce signal to an input signal generally corresponding to the image captured at the first station. The imaging system also include a compositor for compositing the differential signal with one or more other image signals and/or a predetermined composite signal to provide a composited video image (97) which appears visually contiguous and seamless.

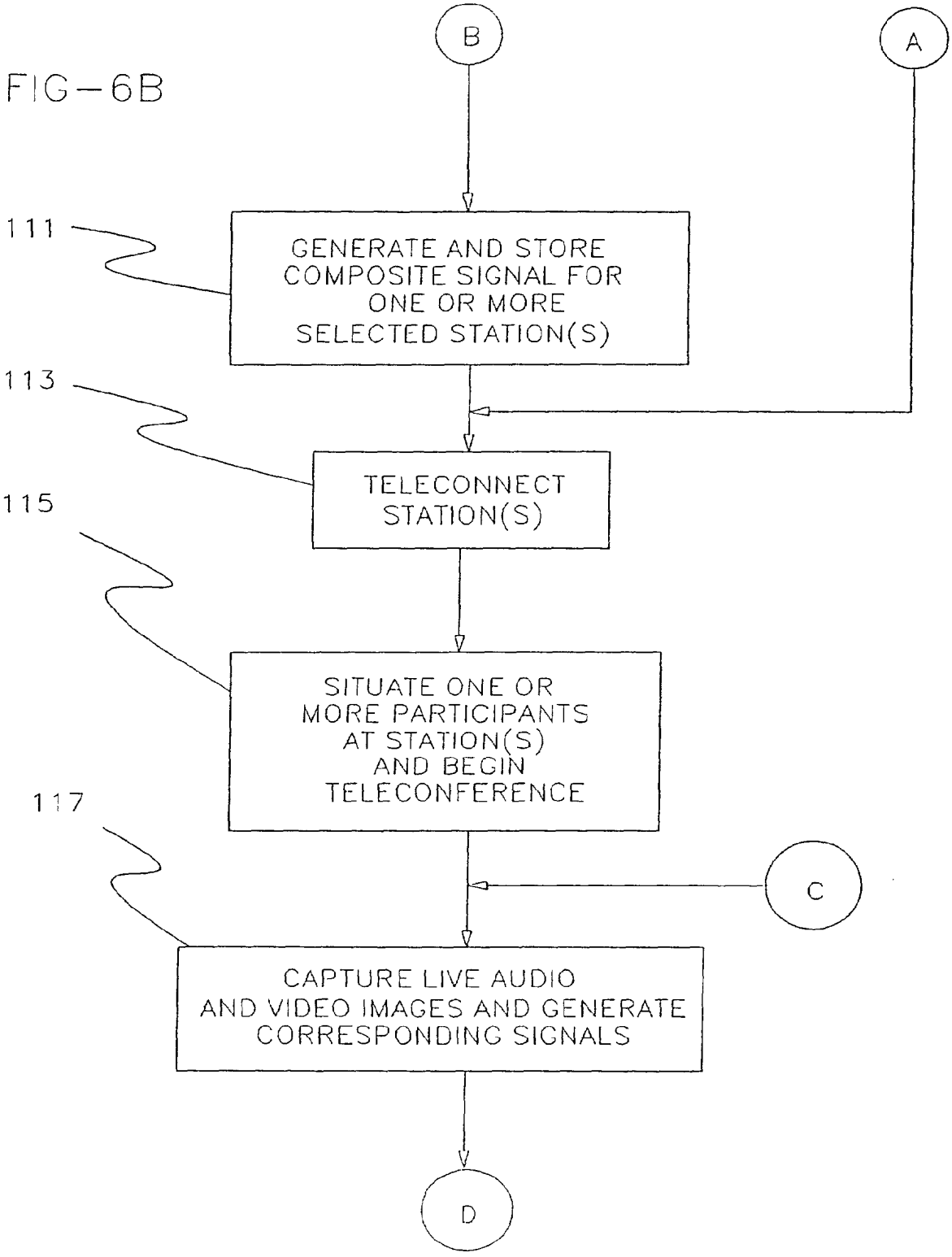
FIG-6A



EP 1 187 480 A1

(Cont. next page)

FIG-6B


B
A
111
GENERATE AND STORE COMPOSITE SIGNAL FOR ONE OR MORE SELECTED STATION(S)
113
TELECONNECT STATION(S)
115
SITUATE ONE OR MORE PARTICIPANTS AT STATION(S) AND BEGIN TELECONFERENCE
117
C
CAPTURE LIVE AUDIO AND VIDEO IMAGES AND GENERATE CORRESPONDING SIGNALS
D

Description

Background of the Invention

[0001] The present invention is related to a video conferencing system and method and, more particularly, to a teleconferencing system which is capable of producing a "video mirror" at a station such that any participants at one or more remote stations may be imaged and displayed in the video mirror at the station so that they appear to be present or face-to-face with any participants at the station.

[0002] Visual telephone systems presently provide communication between at least two locations for allowing a video conference among participants situated at each station. An objective in some video conferencing arrangements is to provide a plurality of television cameras at one location. The outputs of those cameras are transmitted along with audio signals to a corresponding plurality of television monitors at a second location such that the participants at the first location are perceived to be present or face-to-face with participants at the second location. In achieving good face-to-face presence, the number of conferees included in the video picture from each camera is normally limited to a few people, typically one to four. There are usually a like number of monitors at the receiving station, each strategically focused, aligned and positioned so that their displays appear contiguous, seamless and properly aligned. The apparatuses and methods employed heretofore to achieve proper positioning, focus and alignment have been complex and costly.

[0003] Further, the images captured by the plurality of cameras must be arranged and displayed so that they generate a non-overlapping and/or contiguous field of view, for example, as described in U. S. Patent No. 4,890,314 which issued to Judd et al. on December 26, 1989 and which is hereby incorporated by reference and made a part hereof.

[0004] The prior art systems have also been deficient because they have failed to provide means for generating an image, such as an image of a plurality of participants, at one station, differentiating the image to provide a differentiated image and subsequently compositing the differentiated image with a predetermined composite image to provide a composited image which complements or becomes visually complementary, contiguous or integrated with the remote station when the image is displayed at the remote station.

[0005] Another problem with prior art video conferencing systems is eye contact among participants at the stations. Typically, a camera is placed somewhere above the display monitor at which a participant is observing a display of the participant from the remote station. Consequently, the camera captures the participant at an angle above the participants viewing level or head. Thus, when an image of that participant is displayed at the remote station, it appears as if the participant is looking down (e.g., towards the ground). Previous solutions to this problem have required complex optical systems and methods using, for example, a plurality of lenses and mirrors. The solutions have usually been designed for use when the camera is capturing an image of a single participant, and they fall short when simultaneously capturing images of multiple participants.

[0006] The prior art stations themselves were not architecturally designed in a modular form so that they could be easily assembled, decorated and combined with a video image or sub-image from the remote station in a manner which would enhance the virtual presence environment.

Summary of the Invention

[0007] It is, therefore, a primary object of the present invention to provide a face-to-face teleconferencing system which enables a plurality of participants at a plurality of stations to teleconference such that the participants generally appear face-to-face with one or more participants at remote stations in the teleconferencing system.

[0008] Another object of this invention is to provide a differentiator or differentiating means which facilitates differentiating at least one image captured at a station into a differentiated image which will ultimately be transmitted to at least one remote station.

[0009] Another object of this invention is to provide a method and system for compositing an image or sub-image received from a remote station with a predetermined composite image to provide a composited image, at least a portion of which is displayed at the station.

[0010] Still another object of the invention is to provide a system or method which provides a display having wide aspect ratio while utilizing cameras which generate images having smaller aspect ratios.

[0011] Still another object of the invention is to provide a method and system for defining a predetermined sensory setting at one or more stations in order to enhance the virtual presence environment at that station.

[0012] Still another object of the present invention is to provide a method and apparatus for imaging subjects at one station, processing such images, and displaying such images at a remote station such that such images complement and become and/or become visually integrated with the remote station.

[0013] Another object of this invention is to provide a method and apparatus which is capable of generating a composite image having a plurality of different resolutions.

[0014] Still another object of the present invention is to provide a "video mirror" at a station.

[0015] Yet another object of the invention is to provide an imaging system which provides a simplified means capturing substantially eye level images of participants at stations while also providing means for simultaneously displaying images at such stations.

[0016] Still another object of this invention is to pro-

vide a system and method for compositing a plurality of signals corresponding to a plurality of images from at least one station to provide a contiguous or seamless composite image.

[0017] Still another object is to provide a method and system for providing a plurality of teleconferencing stations that have complementary predetermined sensory settings which facilitate creating a face-to-face environment when images of such settings and participants are displayed at remote stations.

[0018] Another object of the invention is to provide a method and apparatus for generating a video mirror such that an image having a predetermined sensory setting of participants or subjects captured at one station may be displayed at a remote station having a different predetermined sensory setting, yet the remote participants will appear face-to-face in the same predetermined setting as the participants or subjects at the one station.

[0019] In one aspect, this invention comprises an image generator for use in a teleconferencing system comprising a differentiator for comparing a differential reference image to an input video image from a station and for generating a differential image in response thereto, and a compositor associated with a remote station for receiving the differential image and for combining that differential image with a predetermined composite image to provide a composite image.

[0020] In another aspect, this invention comprises a conferencing system comprising a first station comprising a first sensory area defining a first aura, a second station comprising a second sensory area defining a second aura, and an image system for generating a first station image of at least a portion of the first sensory area and also for displaying a composite image corresponding to the first station image at the second station such that the first and second auras become visually combined to provide an integrated face-to-face environment at the second station.

[0021] In another aspect, this invention comprises an image system for use in a conference environment comprising a station having a first conference area and a remote station having a remote video area, the image system comprising a compositor for compositing a first signal which generally corresponds to a video image of a portion of the first conference area with a composite reference signal to provide a composite image signal; and a display for displaying the composited image signal at the remote video area such that the first and second stations appear complementarily integrated.

[0022] In still another aspect of the invention, this invention comprises a teleconferencing system comprising a sensory setting, a second station having a second predetermined sensory setting; and an imaging system for capturing an image at the first station and displaying at least a portion of the image at the second station such that it becomes generally visually integrated with the second predetermined sensory setting.

[0023] In another aspect of this invention, this invention comprises a station for use in a teleconferencing environment comprising a first station predetermined setting, first image sensing means associated with the first station predetermined setting for capturing images at the station for transmission to a remote station, audio means for transmitting and/or receiving audio signals from at least one remote station, and display means for displaying an image including at least one sub-image transmitted to the station from the remote station so that the image becomes integrated with the first station predetermined setting to facilitate providing a face-to-face presence teleconference.

[0024] In still another aspect of the invention, this invention comprises a method for providing a virtual presence conference in a teleconferencing system having a first station and a second station comprising the step of displaying an image formed from at least one sub-image from the first station at a predetermined location in the second station such that the image becomes visually integrated with the second station to define a single predetermined aura at the second station.

[0025] In yet another aspect of the invention, this invention comprises a method for teleconferencing comprising the steps of teleconnecting a first station having a first setting to a second station having a second setting; and displaying a composite image including an image of at least a portion of the first station at the second station such that when the composite image is displayed at the second station it cooperates with the second setting to facilitate providing a face-to-face environment at the second station.

[0026] In still another aspect, this invention comprises a method for teleconferencing comprising generating at least one first station signal generally corresponding to a first station image of the first station, comparing the at least one first station signal to a differential reference signal corresponding to a first reference image and generating at least one differential signal comprising a portion of the first station image in response thereto, compositing the at least one differential signal with a predetermined composite signal corresponding to a predetermined image to provide at least one composite image, and displaying the at least one composite image corresponding to the composite signal at a second station.

[0027] In yet another aspect, this invention comprises a method for generating a seamless image at a station from a plurality of sub-images at least one of which is received from a remote station comprising the steps of generating the plurality of sub-images, and combining the plurality of sub-images with a predetermined composite image to provide the seamless image.

[0028] These advantages and objects, and others, may be more readily understood in connection with the following specification, claims and drawings.

Brief Description of the Accompanying Drawings

[0029] Figs. 1A and 1B, taken together, show a teleconferencing system according to one embodiment of this invention;

[0030] Fig. 2 is a partly broken away top view of a first station of the teleconferencing system shown in Fig. 1A;

[0031] Figs. 3A and 3B, taken together, show another embodiment of the present invention wherein the stations have different predetermined sensory settings;

[0032] Figs. 4A and 4B, taken together, show still another embodiment of the invention having stations which have predetermined sensory settings which are designed, decorated and defined to be complementary and/or substantially identical;

[0033] Figs. 5A and 5B, taken together, provide a visual illustration of the images corresponding to some of the signals generated by the teleconferencing system; and

[0034] Figs. 6A-6D, taken together, show a schematic diagram of a method according to an embodiment of this invention.

Detailed Description of Preferred Embodiment

[0035] Referring now to Figs. 1A and 1B, a teleconferencing system 10 is shown having a first station or suite 12 and a second station or suite 14. The first station 12 comprises a first conference or sensory area 16, and the second station 14 comprises a second conference or sensory area 18-1, respectively. The first and second stations 12 and 14 also comprise a first video area 20 and a second video area 22-1, respectively, associated with the first and second conference areas 16 and 18-1. The first video area 20 is generally integral with a wall 32h in the first station 12. Likewise, the second video area 22-1 is generally integral with a wall 32h-1 in the second station 14. In the embodiment being described, the first and second stations are geographically remote from each other, but they could be situated on the same premises if desired.

[0036] For ease of illustration, the construction and modular assembly of the stations in teleconferencing system 10 will be described in relation to the first station 12. As shown in the sectional top view of Fig. 2, the first station 12 is shown assembled or constructed into a generally elongated octagonal shape. The first station 12 comprises a plurality of modular members 32a-32h which include walls 32a, 32c-e, 32g-h, doors in wall members 32b and 32f and entry facade 32f-1. The first station 12 also comprises a ceiling 34 (Fig. 1A) which is mounted on the members 32a-32h with suitable fasteners, such as nuts, bolts, adhesives, brackets, or any other suitable fastening means. Notice that the ceiling 34 has a dropped or sunken portion 34a which supports appropriate lighting fixtures 56.

[0037] In the embodiment being described, each of the members 32a-32h and the ceiling 34 is molded or formed to provide or define an environment having a unique architectural setting and/or sensory setting. For example, as illustrated in Fig. 1A, the wall member 32a may be formed to provide a plurality of stones 36, a plurality of columns 38, and an arch 40 to facilitate defining a first predetermined setting 12a having a Roman/Italian motif, theme or aura. One or more of the members 32a-32h may be provided with inlays, wall decorations (like picture 58 in Figs. 1A and 2), or even a permanent frosted glass window and frame arrangement 42 mounted therein. Furthermore, members 32b and 32f (Fig. 2) may be provided with sliding doors 44 which facilitate entering and exiting the first station 12 and which are designed to complement or further enhance the Roman/Italian motif.

[0038] In the embodiment being described, notice that member 32h (Figs. 1A and 2) is formed to provide a stone and pillar appearance and texture complementary to the stone and pillar appearance and texture of the wall members, such as member 32a. Also, the member 32a may be shaped to frame or mask a rear projection screen 46, as shown. The function and operation of the rear projection screen 46 will be described later herein. In the embodiment being described, the rear projection screen 46 comprises a high resolution lenticular rear projection screen which is either integral with or mounted directly to member 32h to provide a first video area 20 having a usable projection area of about 52 inches by 92 inches (1,32m×2,34m) with an associated aspect ratio of 16:9.

[0039] Each of the members 32a-32h and ceiling 34 are created in separate modular units using a plurality of molds (not shown). In the embodiment being described, a suitable material for molding the members 32a-32h and ceiling 34 to provide a granite-like appearance may be Gypsum, but they could be formed from other suitable material such as stone or clay-based materials, ceramic, paper, cardboard, foam, wood, Styrofoam and the like. As illustrated in 1A and 2, the member 32d may be provided with a shelf or mantle 33. The various members 32a-32h are assembled together as shown in Fig. 2 and secured together with suitable support braces 48 which may be secured to the walls 32a-32h with any suitable fastener such as screws, bolts, an adhesive or the like. After the first station 12 is assembled and the ceiling 34 is secured thereto, it has a length of about 14 feet, 6 inches (4,42m) (indicated by double arrow L in Fig. 2) and a width of about 12 feet, 0 inches (3,66m) (indicated by double arrow W in Fig. 2). The first station 12 has an approximate height from floor to ceiling 34 of about 8 feet, 6 inches (2,59m). Further, the members 32a, 32c, 32e and 32g have a width (indicated by double arrow Y in Fig. 2) of about 5 feet, 0 inch (1,52m). Finally, the back wall member 32d and front wall member 32h comprises a width of about 7 feet, 8 inches (2,33m) (indicated by double arrow X in Fig. 2).

[0040] After the members 32a-32h and ceiling 34 are assembled, the first station 12 may be further decorated,

designed or ornamented with a plurality of subjects, decorations or ornaments which facilitate providing the first predetermined sensory setting 12a which defines a first aura, motif or theme. Likewise, the second station 14 maybe further provided or ornamented with a plurality of subjects, decorations or ornaments which facilitate providing a second predetermined sensory setting 14a which defines a second aura, motif or theme. For example, as illustrated in Fig. 1A, the predetermined sensory setting 12a of the first station 12 may be further decorated with a table 50, table decorations, pillar and wall decorations, carpet (not shown), plants 54 and other wall decorations (not shown) to further enhance the Roman/Italian motif, theme or aura. The first and second predetermined sensory settings 12a and 14a may also comprise appropriate lighting fixtures 56 and appropriate furnishings, such as chairs 60 and tables 61, which complement the predetermined setting to further facilitate defining the Roman/Italian theme or motif for the stations 12 and 14.

[0041] It should be appreciated that once the first and second stations 12 and 14 are assembled and ornamented or decorated to provide their respective first and second predetermined sensory settings 12a and 14a, they define an aura, theme or motif which facilitates providing or creating a very sensual and impressionable environment. Providing such a station, such as station 12, with a strong sensory environment facilitates enhancing the virtual presence illusion created by teleconferencing system 10 of the present invention.

[0042] It should also be appreciated, however, that although the first station 12 and second station 14 are shown in the embodiment in Figs. 1A and 1B as having complementary or similar first and second predetermined sensory settings 12a and 14a, they could be provided with first and second predetermined sensory settings 12a and 14a having different themes, motifs or auras. Thus, while the embodiment described in relation to Figs. 1A and 1B illustrate a first and second set of stations 12 and 14 having a Roman/Italian motif, another set of stations, such as station 12' and station 14' in the embodiment illustrated in Figs. 3A and 3B, may have at least one station having a different predetermined setting. For example, the second station 14' in Fig. 3B provides a setting 14a' which defines a Chinese aura, theme or motif.

[0043] It should also be appreciated that the members 32a-32h, ceiling 34 and associated predetermined sensory setting are provided to be transportable and capable of being assembled at any suitable location, such as an existing rectangular room, suite or conference area having dimensions of at least 20 feet x 20 feet x 9 feet. (6,10m×6,10m×2,74m). While it may be desirable to provide the first and second stations 12 and 14 in the teleconferencing system 10 with substantially the same dimensions, it should be appreciated that they could be provided with differing dimensions, depending on, for example, the number of participants at each station. It should also be appreciated that the second station 14 and other stations described herein would preferably be manufactured and assembled in the same or similar manner as the first station 12. Also, the stations in the teleconference system 10 may be decorated with wall, ceiling and floor coverings to provide, for example, the first predetermined sensory setting 12a without using the preformed or molded modular members 32a-32h described above, although the use of such members may be preferable in this embodiment.

[0044] The teleconferencing system 10 also comprises conferencing means or a conferencing system means for teleconnecting the first and second stations 12 and 14 together to facilitate capturing an image or images at one of said stations and displaying at least a portion of the image or a sub-image at another of the stations such that it becomes generally visually integrated with the predetermined sensory setting at that station, thereby facilitating creating a "video mirror" and a "face-to-face" environment for the participant situated at that station. As shown in Fig. 1a, the conferencing system associated with the first station 12 comprises image sensor means, imager or image sensors for sensing images at the first station 12. For the embodiment shown in Figs. 1A and 2, the image sensor means comprises a plurality of cameras which are operably associated with the rear projection screen 46 of first station 12. In this regard, the plurality of cameras comprise a first camera head 62 and second camera head 64 which are operatively coupled to a first camera control unit 66 and second camera control unit 68, respectively. Notice that the first and second camera control units 66 and 68 are remotely situated from the first and second camera heads 62 and 64. This facilitates permitting the first and second cameras 62 and 64 to be placed directly in the projection path of the rear projection screen 46, without substantially interfering with the video image being projected.

[0045] In the embodiment being described, the first camera head 62 and second camera head 64 are situated approximately 16 inches (40,6cm) above he surface of table 50 which generally corresponds to the eye level of the seated participants situated at table 50. As illustrated in Fig. 2, the first and second cameras 62 and 64 are situated behind the rear projection screen 46 in operative relationship with a pair of 1-1/4 inch (31,8mm) diameter openings 66 and 68, respectively. The first and second cameras 62 and 64 are mounted on a suitable narrow or non-interfering bracket (not shown) such that they can be positioned behind the rear projection screen 46 in operative relationship with openings 66 and 68, respectively. In the embodiment being described, the first and second cameras 62 and 64 are 1-1/4 inch by 1-1/4 inch (31,8×31,8mm) 3-CCD camera heads which generate images having an aspect ratio of about 3:4 and a picture resolution of about 494 x 700 pixels. One suitable 3-CCD camera heads 62 and 64 and associated camera control units 66 and 68 may be Model No.

GP-US502 manufactured by Panasonic Broadcast and Television Systems Company of Japan. It should be appreciated that while the teleconferencing system 10 shown and described in relation to Figs. 1A and 1B show image sensor means comprising a plurality of camera heads 62 and 64 and camera control units 66 and 68 situated at a station, a single camera may be used (as shown and described relative to the embodiment shown in Figs, 4A and 4B) or even multiple cameras could be used depending on such things as the size of the station, the number of participants situated at the station, and/or the aspect ratio of each camera head selected. It should also be appreciated that the camera heads 62 and 64 and associated camera control units 66 and 68 are configured and positioned at the first station 12 to facilitate providing maximum vertical eye contact among participates in the teleconference, while minimally interrupting the substantially life-size video projection on the rear projection screen 46.

[0046] The conferencing means also comprises a first differentiator or differential key generator 70 (Fig. 1A) and a second differentiator or differential key generator 72, respectively. The camera control unit 66 generates an RGB analog signal I-62 which is received by the first differentiator 70, and the camera control unit 68 generates an RGB signal I-64 which is received by the second differentiator 72. The first and second differentiators 70 and 72 provide means for processing the image signals generated by the camera control units 66 and 68 to remove or differentiate any undesired portion of the images corresponding to the signals I-62 and I-64. For example, as described in detail later herein, it is desired in this embodiment to separate the image of the participants situated at the first station 12 from at least a portion of the first predetermined sensory setting 12a, such as the background behind the participants, in order to provide a differential signal VS-1 that has that portion of the first predetermined sensory setting 12A removed. This, in turn, facilitates transmitting the video image of the participants at the first station 12 to the remote second station 14 and also facilitates compositing the image with other images, as described below.

[0047] Suitable differentiators 70 and 72 may comprise the differential key generator shown and described in U.S. Patent No. 4,800,432, issued on January 24, 1989 to Barnett et al. and assigned to The Grass Valley Group, Inc., which is incorporated herein by reference and made a part hereof.

[0048] The differential key generators 70 and 72 convert the I-62 and I-64 signals from RGB analog signals to digital image signals having corresponding images 104 and 106 (Fig. 5A), respectively. The differential key generators 70 and 72 compare the digital image signals to an associated differential reference signals DRS-62 and DRS-64, respectively, which generally corresponds to images 108 and 110 in Fig. 5A. As described in detail later herein, these images 108 and 110 comprise at least a portion of the first predetermined sensory setting 12a such as the background. The differential reference signals DRS-62 and DRS-64 are stored in appropriate storage 74 and 76 (Fig. 1A) associated with the differential key generators 70, 72, respectively. In the embodiment being described, the differential reference signals DRS-62 and DRS-64 comprise a reference frame of a video image grabbed by one or both cameras 62 or 64 situated at the first station 12 from a video sequence of the first predetermined sensory setting 12a of the first station 12 background where no participants, chairs, or other foreground elements are in place.

[0049] In response to the comparison, the first and second differentiators 70 and 72 generate differentiated video signals VS-1 and VS-2 (Fig. 1A), respectively. As illustrated in Fig. 5, the VS-1 and VS-2 signals generally correspond to the individuals situated at the first station 12 when viewed in the direction of arrow A in Fig. 2. As illustrated in the images 112 and 114 (Fig. 5) associated with the VS-1 and VS-2 signals, respectively, notice that the background area shown in images 104 and 106 has been removed and is tagged as a "zero" image area.

[0050] Advantageously, tagging at least a portion of the image represented by the VS-1 signal as "zero" background facilitates compressing the VS-1 and VS-2 signals and providing corresponding compressed CDS-1 and CDS-2 signals, thereby reducing the amount of transmission band width needed. This tagging also facilitates compositing or overlaying another predetermined image to provide a seamless composited image as described in detail below.

[0051] The video signals VS-1 and VS-2 are received by a first compression/decompression means or CODEC 78 and a second compression/decompression means or CODEC 80, respectively. The CODECs 78 and 80 also receive an audio signal AS-A1 and AS-A2 from suitable microphones 82 and 83, respectively, which may be positioned or concealed at an appropriate location in the first station 12, such as underneath or on top of table 50, as illustrated in Fig. 1A. The function of the first and second CODEC 78 and 80 is to compress video and audio signals for transmitting to remote stations, such as the second station 14, and also to decompress compressed video and audio signals received from remote stations. Consequently, the CODECs 78 and 80 are configured with suitable compression and decompression algorithms which are known to those of ordinary skill in the art. The CODEC Model No. Rembrandt II VP available from Compression Labs, Inc. of San Jose, California is suitable for use in the embodiment described herein, but it should be noted that other suitable compression/decompression means may be employed.

[0052] The CODEC 78 receives the video signal VS-1 and audio signal AS-A1, and CODEC 80 receives the video signal VS-2 and audio signal AS-A2. The CODECs 78 and 80, generate digital signals CDS-1 and CDS-2, respectively, in response thereto which are in turn transmitted to remote station 14 via a transmission

network 84.

[0053] The transmission network 84 may be configured as a private network, public circuit switch service, and it may utilize telecommunication and/or satellite technology. In the embodiment being described, the transmission network 84 preferably includes a plurality of T-1 lines (not shown) which are capable of accommodating bit streams having a suitable band width, such as 1.544 megabytes per second.

[0054] The teleconferencing system 10 and conference means associated with the first station 12 also comprises enhancing means for enhancing the resolution of an image or sub-image received from a remote station, such as the second station 14. In the embodiment being described, enhancing means comprises a first line doubler 86 and a second line doubler 88 which are operatively coupled to the first CODEC 78 and second CODEC 80, respectively. In this embodiment, the first and second line doublers 86 and 88 enhance the resolution and picture quality of at least a portion of the image corresponding to video signals VS-3 and VS-4 received from the CODECs 78 and 80, respectively, by about 50-150%. The VS-3 and VS-4 signals correspond to images or sub-images received from remote station (s), such as station 14, as described in detail below. One suitable line doubler is the Model No. LD 100 available from Faroudja Laboratories, Inc. of Sunnyvale, California, but other suitable enhancing means may be provided to provide greater or less enhancement of the images to be displayed. For example, lenses, mirrors, optical pixel interpolation or other electrical means may be employed as desired. It should also be noted that the present invention may be performed without the use of any enhancing means without departing from the scope of the invention.

[0055] The first and second line doublers 86 and 88 generate enhanced video signals which are input into compositing means, compositor or video compositing multiplexer 92 for compositing the enhanced video signals associated with the images or sub-images received from the remote station(s) with one or more predetermined composite signals, such as predetermined composite signal A, corresponding to a predetermined composite image or sub-image which are stored in a suitable storage device 94 associated with the compositor 92. In the embodiment being described, the predetermined composite signal A corresponds to an image of at least a portion of first predetermined sensory setting 12a, such as the background of the first station 12. The video compositing multiplexer 92 composites the signals received from the first and second line doublers 86 and 88 with the predetermined composite signal A and generates a RGB analog composite signal in response thereto. It has been found that Model No. E-Space-1 available from Miranda Technologies, Inc. of Montreal and Quebec, Canada, is one suitable video compositing multiplexer 92.

[0056] The teleconferencing system 10 comprises a projector 96 coupled to the video compositing multiplexer 92 which receives the RGB composite signal and projects a corresponding image 90 (Fig. 1A) corresponding to the composite signal on the rear projection screen 46. The Model No. 3300 available from AMPRO Corporation of Titusville, Florida has been found to be a suitable projector 96. Although the embodiment has been described using projector 96 and rear projection screen 46, other suitable means may be employed for projecting or displaying the composited image. For example, a liquid crystal display (LCD) or other electronic screen may be suitable to display images at a station. This may eliminate the need for the projector 96.

[0057] The projector 96 could be used with an optical system or a plurality of mirrors (not shown), or prisms (not shown) such that the projector can be positioned, for example, to the side or below the rear projection screen 46 or in a manner that permits the projector 96 to project the image towards a mirror (not shown), which causes the image to be projected on the rear projection screen 46.

[0058] As described in detail below, the composite signal and its corresponding image 90 generally comprise a video image of at least a portion of the first predetermined sensory setting 12a combined or composited with a differentiated image, such as an image of the participants from the second station 14 which correspond to the VS-3 and VS-4 (Fig. 1B) signals. Consequently, the resultant image 90 projected on screen 46 at the first station 12 complements or blends with the architectural motif, aura, theme or design defined by the first predetermined sensory setting 12a at the first station 12, such that the projected image 90 appears visually integrated with the first predetermined sensory setting 12a of the first station 12. This, in turn, causes any image of the participants situated at the second station 14 and included in the image 90 to appear to be face-to-face with participants at the first station 12 during the teleconference. The operation of the compositor 92 is described in more detail later herein.

[0059] It should be appreciated that the sub-images or images received from the remote station(s) typically have a resolution on the order of about 352 x 288 pixels and the predetermined composite signal A comprises a resolution on the order of about 1280 x 1024 pixels. Thus, the resultant composite image 90 may comprise, for example, an image of the participants situated at the second station 14 having a first resolution and a background image of the first station 12 having a second resolution, which is higher than the first resolution. This enables compositor 92 to provide a composite image 90 which, when displayed on screen 46, gives the illusion or effect of a "video mirror" to the participants situated at the first station 12.

[0060] The teleconferencing system 10 also includes audio means comprising a plurality of speakers 100 and 102 (Figs. 1A and 2) which, in turn, receive audio signals AS-B1 and AS-B2 from CODECs 78 and 80, respective-

ly. It should be appreciated that the audio signal AS-B1 and AS-B2 generally correspond to the audio associated with the sound (e.g., voices, music and the like) associated with the remote station(s), such as second station 14.

[0061] It should also be appreciated that the rear projection screen 46 and projector 96 are configured and selected to enable the teleconferencing system 10 to project the composited image 90 (Fig.1A) at a predetermined scale, such as substantially full scale. In this regard, the compositor 92 comprises a scaler 95 which is integral therewith for scaling the composited signal associated with the composited image 90 to a desired or predetermined scale, such as substantially full scale.

[0062] Referring now to Fig. 1B, the second station 14 comprises similar components as the first station and such like components are labelled with the same reference numeral as their corresponding component in the first station 12, except that the components associated with the second station 14 have a "-1" designator added thereto. Such components operate and function in substantially the same manner as described above with regard to the first station 12 with the following being some differences. The differential reference signals DRS-3 and DRS-4 (Fig. 5) associated with the second station 14 generally correspond to an image or sub-image of at least a portion of the second predetermined sensory setting 14a, such as the background 98-1, of the second station 14. Such sub-image or image may include at least a portion of the background 98-1 without any participants, chairs or other foreground subjects situated in the second station 14. Also, like the predetermined composite signal A stored in the storage 94 associated with the first station 10, a predetermined composite signal B may be stored in the storage 94-1 associated with the compositor 92-1 second station 14. The predetermined composite signal B may correspond to an image or sub-image of at least a portion of the second predetermined sensory setting 14a of the second station 14. Such sub-image or image may include, for example, an image of the walls 32a-1 to 32h-1 and conference area 18 or background of the second station 14. Notice that in the embodiment shown in Figs. 1A and 1B, the second station 14 has a second predetermined sensory setting 14a which mirrors or is complementary to the first predetermined sensory setting 12a. As described above, however, the first and second predetermined sensory settings 12a and 14a may be different.

[0063] A method of operating the teleconferencing system 10 will now be described in relation to Figs. 6A-6D. The modular components, such as members 32a to 32h and ceiling 34 for first station 10, decorations and the like, are configured, assembled and decorated (block 99 in Fig. 6A) at a desired location to provide a conference station comprising a predetermined sensory setting defining a predetermined theme, motif or aura. As mentioned earlier herein, the theme, motif or aura may be complementary (as shown in Figs. 1A and 1B) or they can be completely different, as shown in Figs. 3A and 3B (described below). For ease of illustration, it will be assumed that the stations are assembled and decorated as shown and described relative to the embodiment in Figs. 1A and 1B.

[0064] Once the modular stations 12 and 14 are assembled and decorated, it may be desired (decision point 101 in Fig. 6A) to use differentiator (e.g., differentiator 72 in Fig. 1A). As discussed herein relative to the embodiments shown in Figs. 4A and 4B, it may not always be desired to generate a differential reference image, thereby making it unnecessary to generate the differential reference signal. If differentiation is desired, then the camera heads 62 or 64 generate at least one video image (block 103) of at least a portion of the first predetermined sensory setting 12A at the first station 12. The differentiators 72 and 74 grab or capture at least one differential reference image or sub-image from those images and generate (block 107) the differential reference signals DRS-62 and DRS-64, respectively. These signals are stored in suitable storage 74 and 76 for use by the differentiators 70 and 72, respectively. Likewise, cameras 62-1 and 64-1 at the second station 14 generate video images of at least a portion of the second predetermined setting 14a at the second station 14. The differentiators 70-1 and 72-1 grab or capture at least one differential reference image or sub-image from those images and generate differential reference signals (not shown) corresponding thereto. These signals are then stored (block 109) in suitable storage 74-1 and 76-1 for use by differential key generators 70-1 and 72-1, respectively.

[0065] As mentioned above, it is preferred that the differential reference signals DRS-62 and DRS-64 comprise an image of at least a portion of the first predetermined sensory setting 12a, such as an image of the first station 12 without any participants, chairs or other subjects which are not stationary during the teleconference. Likewise, it is preferred that the differential reference signals associated with the differentiators 70-1 and 72-1 comprise at least a portion of the second predetermined sensory setting 14a at the second station 14, such as an image of the background 98-1 without the participants, chairs and other subjects which are not stationary during the teleconference.

[0066] If differentiation of signals is not selected or at the end of the differentiation process, it may be desired to generate a composite image (decision point 97) for one or more of the stations. As discussed below, however, this may not always be required to achieve certain advantages of the invention. Such predetermined composite image would preferably include a substantial portion of the first predetermined sensory setting 12a, including the background and/or conference area 16 of the first station 12. If compositing is desired, then the predetermined composite signal A is generated (block 111 in Fig. 6B). The corresponding predetermined composite signal A may then be stored in suitable storage

94. In the same manner, the predetermined composite image at the second station 14 and corresponding predetermined composite signal B may be generated and stored as predetermined composite signal B in suitable storage 94-1. In the embodiment being described, the predetermined composite image associated with the second station 14 includes an image of at least a portion of the second predetermined sensory setting 14a, including the background 98-1.

[0067] In the embodiment being described, the predetermined composite signals A and B are generated by a suitable still camera (not shown) to provide a still image (not shown) of the station 12 or 14 being photographed. The still image would subsequently be scanned and digitized for storage by a suitable scanner (not shown). The still camera and scanner would preferably be capable of generating images having a resolution on the order of about 1280 x 1024 pixels. Thus, if compositing is performed, the resultant composite image (such as image 90 in Fig. 1A) may comprise an image having a high resolution background, for example, combined with a comparatively lower resolution image of the remote station participants. This, in turn, facilitates enhancing the "video mirror" effect wherein a mimic or replication of a common architectural technique of mirroring a wall of a given room which makes the overall room appear to be extended beyond its actual wall line.

[0068] Once the stations 12 and 14 are configured and the differential reference signals and predetermined composite signals A and B are generated and stored, the first and second suites 12 and 14 may then be teleconnected (block 113) or connected by satellite or other suitable means via the transmission network 84.

[0069] Next, one or more participants may be situated at the first and second stations 12 and 14. As illustrated in Fig. 2, notice that the participants seated at the first station 12 are situated a predetermined distance B from a participant's side 46a of the rear projection screen 46. The predetermined distance B generally corresponds to a preferred or optimum focal distance at which optimum imaging by cameras 62 and 64 may be performed. In the embodiment being described, it has been found that the predetermined distance should be about 5 feet, 6 inches (1,67m). The participants are situated at the second station 14 in a similar manner and the face-to-face teleconference may then begin.

[0070] For ease of illustration, the imaging and display of first station 12 participants at the second station 14 will be described. The first and second cameras 62 and 64 capture (block 117 in Fig. 6B) live images of the participants situated at the first station 12 and generate corresponding RGB analog signals I-62 and I-64 which are received by the differential key generators 70 and 72, respectively. If differentiation was selected (decision point 147 in Fig. 6C), processing continues at block 119 otherwise it proceeds at block 123. The differential key generators 70 and 72 generate (block 121 in Fig. 6C) the digital differential signal VS-1 and VS-2, respectively, after comparing (block 119 in Fig. 6C) the I-62 and I-64 signals received from cameras 62 and 64 to their respective differential reference signals DRS 62 and DRS-64 which are received from storages 74 and 76.

[0071] The differential signals VS-1 and VS-2 are then received by CODECs 78 and 80 which also receive the audio signals AS-A1 and AS-A2 which correspond to the audio, including sounds, music and voices, associated with the first station 12. The CODECs 78 and 80 digitize the audio signals AS-A1 and AS-A2, combine the audio signals with their respective video signal VS-1 or VS-2, and generate (block 123) the compressed CDS-1 and CDS-2 signals in response thereto. The CDS-1 and CDS-2 signals are then transmitted (block 125) to the second station 14 via the transmission network 84 (Fig. 1B).

[0072] The CDS-1 and CDS-2 signals are received and decompressed (block 127 in Fig. 6C) by CODECs 78-1 and 80-1, respectively, associated with the second station 14 to provide decompressed VS-1 and VS-2 signals. The CODECs 78-1 and 80-1 also decompress the audio signals AS-A1 and AS-A2 received from the first station 10 which are transmitted to speakers 100-1 and 102-1, respectively, at the second station 14.

[0073] Substantially simultaneously with the broadcasting of the audio signals at the second station 14, CODECs 78-1 and 80-1 decompress the CDS-1 and CDS-2 signals to provide VS-1 and VS-2 signals. The decompressed video signals VS-1 and VS-2 are then received by line doublers 86-1 and 88-1. If it is desired to enhance the signals (decision point 129), then the line doublers 86-1 and 88-1 process or manipulate the signals (block 131) in order to enhance the resolution of the image corresponding to those signals. After the signals VS-1 and VS-2 are processed, it may be desired to composite (decision point 133 in Fig. 6D) those signals with one or more other signals. In this illustration, for example, the video compositor 92-1 composites images (block 135) corresponding to those signals with at least one predetermined composite image, such as image 122 (Fig. 5B) corresponding to the predetermined composite signal B provided from storage 94-1 (Fig. 1B) to provide a composite signal. As mentioned above, the composite signal generally corresponds to the composited image 91-1 to be displayed on the rear projection screen 46-1 at the second station 14.

[0074] The compositor 92-1 may (decision point 137, block 139 in Fig. 6D) scale the composited image to a desired scale, such as full scale, using scaler 95-1. Thereafter, the compositor 95-1 transmits a corresponding RGB analog signal to projector 96-1 which displays (block 141) the scaled, composited image on the rear projection screen 46-1 (Fig. 1B).

[0075] The teleconference may then be continued or terminated as desired (decision point 143, block 145).

[0076] Because the composited image is substantially full scale when projected and includes a high resolution image of at least a portion of the second predeter-

mined sensory setting 14a, the image appears to blend or become visually integrated with the second predetermined sensory setting 14a. This, in turn, gives the participants situated at the second station 14 the perception that the first station participants are present or face-to-face with them in the second station 14.

[0077] In the same or similar manner, images and signals relative to the second station 14 images are captured, processed and displayed at the first station 12. So that images of the participants at the second station 14 are displayed at the first station 12 such that they appear to have a face-to-face presence at the first station 12. Thus, images of the second station 14 participants may be differentiated and composited such that, when they are displayed at the first station 12, the image completes or provides "the other half" of the first station 12 and becomes generally visually integrated therewith. Although not required, it may be desirable to enhance the face-to-face presence by providing, for example, first and second predetermined sensory settings 12a and 14a which define a dining environment wherein food or meals may be served. For example, the face-to-face presence may be further enhanced if the participants at both stations 12 and 14 order food and drinks from identical menus. Also, trained maitre-de and/or waiters may be used to actively promote the perception of a face-to-face dinner using a scripted dialog and interaction with remote participants, maitre-de and/or waiters.

[0078] Once the teleconferencing is terminated, the stations 12 and 14 may be used by the same or different participants without the need to reconstruct or reassemble the stations.

[0079] Figs. 5A and 5B provide a visual illustration of the images corresponding to some of the signals described above utilizing the method and embodiment described above. In this regard, images 104 and 106 generally correspond to the actual images captured by the first and second cameras 62 and 64, respectively. As described above, associated image signals I-62 and I-64 are transmitted to the differential key generators 70 and 72, respectively. The differential key generators 70 and 72 compare the images 104 and 106 to the images 108 and 110 associated with the differential reference signals DRS-62 and DRS-64 which are received from storages 74 and 76, respectively, and which were previously generated by cameras 62 and 64 from an identical fixed camera position.

[0080] As illustrated in Fig. 5A, the differential key generators 70 and 72 generate differential signals VS-1 and VS-2 which have corresponding images 112 and 114. Notice that these images 112 and 114 comprise an image of the participants which are situated at the first station 12 with the background area having been removed or tagged as a "zero" area. As described herein, this "zero" area becomes "filled-in" with the desired or predetermined composite image which may include, for example, an image of at least a portion of the predetermined setting or background of the second station 14. It has been found that removing a portion of the image, such as the background, by tagging it as zero, in the manner described herein, facilitates compressing the signals VS-1 and VS-2 and reducing the amount of bandwidth needed to transmit the images over transmission network 84 and between the first and second stations 12 and 14.

[0081] As mentioned above, the video signals VS-1 and VS-2 are fed into CODECs 78 and 80 which compresses the signals along with audio signal AS-A1 and AS-A2 and generates signals CDS-1 and CDS-2. The CDS-1 and CDS-2 signals are then transmitted, via transmission network 84, to the second station 14 and received by the CODECs 78-1 and 80-1 associated with the second station 14. As-illustrated in Fig. 5B, the CODEC 78-1 and 80-1 decompresses the CDS-1 and CDS-2 signals, respectively, from the first station 12 and feeds them into associated line doublers 86-1 and 88-1. As mentioned earlier herein, the line doublers 86-1 and 88-1 facilitate enhancing the images associated with the video signals to provide enhanced video signals EVS-1 and EVS-2 (Fig. 5B), respectively.

[0082] As stated earlier, the enhanced video signals EVS-1 and EVS-2 are then received by the video compositing multiplexer 92-1 associated with the second station 14 wherein the signals are combined to provide an intermediate composite signal ICS having an associated intermediate composite signal image 120 having an aspect ratio of about 8:3.

[0083] The video compositing multiplexer 92-1 also receives the predetermined composite signal B having a predetermined composite signal B image 122 from storage 94-1. The video compositing multiplexer 92-1 composites or combines the images 120 and 122 to generate the composite signal having an associated or corresponding composite image 124 as shown in Fig. 5B. As stated earlier, the predetermined composite signal B image 122 generally corresponds to at least a portion of the predetermined setting or background of the second station 14 and has an aspect ratio of 16:9.

[0084] Notice that when the predetermined composite signal B image 122 is combined with the intermediate composite signal image 120, the video compositing multiplexer 92-1 causes the "zero" area of the intermediate composite signal image 120 to be "filled in" with the predetermined composite signal B image.

[0085] The composite image 124 may then be scaled to a predetermined size or scale, such as full scale, using scaler 94-1, so that the composite image 124 may be scaled to a substantially full scale or real-life size image as desired. The composite image signal corresponding to the composite image 124 is transmitted to the projector 96-1 and then displayed on the rear projection screen 46-1 at the second station 14. As illustrated in Figs. 1B and 5B, the composite image 124 may be appropriately framed or masked (such as with an archway 125 in Figs. 1B and 5B) when it is projected at the second station 14 to enhance the face-to-face, real time

environment.

[0086] The audio and video signals transmitted between the first and second stations 12 and 14 may be, in this illustration, transmitted over separate T-1 lines (not shown) in the transmission network 84 in order to effect a substantially simultaneous and/or "real time" video conference. Thus, in the illustration shown in Figs. 1A and 1B, the participants may be geographically remotely located, yet the participants situated at the first station 12 will feel as if the second station 14 participants are located face-to-face or present with them at the first station 12, while the participants situated at the second station 14 will feel as if the first station participants are face-to-face or present with them at the second station.

[0087] It should be appreciated that when the predetermined composite signal B and associated predetermined composite signal image 122 is composited with the intermediate composite signal and associated intermediate composite signal image 120, it overlays that signal to provide a seamless composite image 124, which facilitates reducing or eliminating the need to match up the borders or seams of the camera images with any high degree of accuracy. In this regard, it is preferable that cameras 62 and 64 and 62-1 and 64-1 preferably be situated such that they capture an entire participant rather than, for example, half of a participant. Thus, it may be desired to position the participants in a location such that any particular participants will not be in the field of view of more than one camera.

[0088] Advantageously, the invention provides an apparatus and method for providing a video mirror at each station 12 and 14 which facilitates creating a face-to-face and non-interrupted image of any participants in the video conference. Because the image of the participants is differentiated, less transmission bandwidth, computer memory and the like is required. Also, the differentiators and compositors of the present invention enable a user to create a composite image 124 (Fig. 5B) having at least a portion thereof imaged at a greater resolution than the portion which was transmitted over transmission network 84. This facilitates reducing the effect of limitations or transmission restrictions of the transmission network 84 which, in turn, facilitates increasing the quality of images displayed at a station.

[0089] In addition, notice that the composite image 124 (Fig. 5B) may have an aspect ratio which is different from the aspect ratio of the cameras 62 and 64. This enables the system and method of the present invention to utilize cameras which generate images having smaller or even larger aspect ratios. This also enables the system and method to use cameras having standard or common aspect ratios, such as 4:3.

[0090] Figs. 3A and 3B, when taken together, illustrate another embodiment of the invention. The operation and components of the embodiment shown in Figs. 3A and 3B are substantially the same as the operation of components of the embodiment described above relative to Figs. 1A and 1B with the same reference numerals being used for the same components with the addition of single prime (') designator. Consequently this embodiment is similar to the embodiment shown in Figs. 1A and 1B, except that the second predetermined setting 14a' in Fig. 3B and its associated theme, aura or motif is substantially different from the second predetermined setting 14a shown in Fig. 1B. In Fig. 3B, the first predetermined sensory setting 12a' comprises a plurality of decorations 120 defining the Chinese theme, motif or aura. Also, the predetermined composite signal A stored in storage 94-1' and the differential reference signals stored in storages 74-1' and 76-1 would generally correspond to an image of least a portion of that setting 14a'.

[0091] As with the illustration described above relative to Figs. 1A and 1B, the video and audio signals would be processed in substantially the same manner. In general, an image of the participants situated at the first station 12' is composited by compositor 92-1' with a predetermined composite image of at least a portion of the second predetermined sensory setting 14a' of the second station 14' and projected onto the rear projection screen 46-1' at the second station 14'. The first station 12' participants appear to be face-to-face with the second station 14' participants because they have a relatively high resolution video image behind them which complements or becomes integrated with the second predetermined sensory setting 14a'. Thus, as shown in Fig. 3B, the image 91-1' (Fig. 3B) of the ladies at the first station 12' includes a Chinese background which blends or complements the actual predetermined sensory setting 14a'.

[0092] Likewise, when the image of the participants situated at the second station 14' is projected on the rear projection screen 46' at the first station 12', they appear to be in the same room as the participants situated at the first station 12' because the Roman/Italian video background which is seen behind the second station 14' participants generally complements and becomes visually integrated with the actual Roman/Italian theme, motif or aura defined by the first predetermined sensory setting 12' of the first station 12'.

[0093] Figs. 4A and 4B, when taken together, illustrate another embodiment of the invention. The components of the embodiment shown in Figs. 4A and 4B which are substantially identical to the components in the embodiment shown in Figs. 1A and 1B which have the same reference numerals with the addition of a double prime (") designators. As illustrated in Figs. 4A and 4B, two remote modular stations such as stations 12" and 14" may be provided and designed to have first and second predetermined sensory settings 12a" and 14a" which are substantially identical. Thus, as shown in Figs. 4A and 4B, images may be captured in the manner described above at station 12" received by CODECs 78" and 80" and then transmitted, via transmission 84", to associated CODECs 78-1" and 80-1", respectively. The CODECs 78-1" and 80-1" then generate a decom-

pressed signal which may be enhanced by line doublers 86-1" and 88-1", respectively; scaled to an appropriate scale by scaler 95-1"; and then projected by projector 96-1" onto rear projection screen 46-1".

[0094] Notice that the image comprising the second station 14" participants and second predetermined sensory setting 14a" is displayed on screen 46" at the first station 12". Thus, this embodiment does not utilize the differentiating and compositing features of the previous embodiment, but may still achieve a face-to-face conference environment because the second predetermined sensory setting 14a" is configured to be identical to or complementary with the first predetermined sensory setting 12a". In this embodiment, entire images or sub-images of the stations 12 and 14 (including images of both participants and background) are displayed at remote station(s). Because the stations 12" and 14" are assembled, decorated and designed to be complementary or identical, they appear visually integrated to participants situated in the stations 12 and 14. Accordingly, the first and second predetermined sensory settings 12a" and 14a", including the background, are designed and arranged in a geometric fashion such that as cameras 62" and 64" capture images of the participants, they also capture images of the first and second predetermined sensory setting 12a" and 14a", respectively, at the most advantageous perspective for display at the remote station(s). As with prior embodiments, this causes the first station 12" participants to perceive that the second station 14" participants are situated or present with the first station 12" participants at the first station 14". Likewise, the first station 12" participants appear to be face-to-face with the second station 14" participants at the second station 14" when the images associated with the first station 12" are displayed on screen 46-1". Consequently, by providing complementary or identical first and second predetermined sensory settings 12a" and 14a", a face-to-face conference may be created. As with previous embodiments, it may also be desired to differentiate, enhance, composite or scale the images as described with previous embodiments, but this is not required with the embodiment being described.

[0095] Thus, it should be apparent that stations can be provided with predetermined settings which are completely different, yet, by utilizing the apparatus and method of the present invention, the images of the participants in these stations may be projected at remote stations so that they appear to be virtually face-to-face with the remote station participants at or one more remote station.

[0096] Various changes or modifications in the invention described may occur to those skilled in the art without departing from the spirit or scope of the invention. For example, the screen 46 for station 12 has been shown as being integral with a portion of a wall 32h (Figs. 1A and 2A), it could comprise a larger or smaller portion of that wall 32h, or it could be provided as part of one or more other walls, or even as part of the ceiling 34.

[0097] It should also be appreciated that while the embodiments have been shown and described comprising two stations, images from more than two remote stations may be displayed at a station, thereby permitting a teleconference convention among more than two stations.

[0098] Although not shown, one or more of the compositors, such as compositors 12 or 12-1 (Fig. 1A) may comprise a stationary or moving image database (not shown) for providing a plurality of predetermined composite signals which define a particular or desired video background. For example, participants may elect to use the arched background of their proximity, choose an event-related scene, or decide to meet in a setting completely unrelated to their site or station. For example, a station having a Manhattan eatery motif may be provided with a screen configured as a window (not shown). Certain moving video backgrounds of a busy New York avenue may be deposited and displayed on the screen to give the illusion that the participants situated at the station are dining in a popular Manhattan eatery.

[0099] It should also be appreciated that while the embodiments being shown and described herein refer to teleconferencing environments that have predetermined settings and motifs or auras relating to dining, the predetermined settings could define any type of aura, theme or motif which is suitable for video conferencing and in which it is desired to provide a "real-life" or face-to-face presence illusion. For example, the apparatus and method of this invention could be used in a business setting, education setting, seminar setting, home environment, religious setting, celebration setting (such as a birthday, retirement party, holiday or anniversary), or any other suitable setting as desired.

[0100] The above description of the invention is intended to be illustrative and not limiting, and is not intended that the invention be restricted thereto but that it be limited only by the spirit and scope of the appended claims.

Claims

1. A teleconferencing system (10)comprising two or more teleconferencing stations (12; 14) remote from each other, each of said stations being equipped with:

audio devices (82, 100; 83, 102) and video devices including a plurality of cameras (62, 64) for the exchange of audio and video transmissions between said teleconferencing stations;

a screen (46) having a first side and a second side said second side being opposite said first side,for displaying a first image (104) of at least one first remote subject and a second image

(106) of at least one second remote subject, said at least one first subject including a remote participant who is not included in said at least one second subject and said first and second images are not entirely overlaid on top of each other when they are displayed on said screen (46);
a first plurality of furnishings (60) on which participants situated at said teleconferencing station (12) may be seated, and which are situated on said second side of said screen;
said first image and said second images are being displayed on said screen (46) to give any of the participants seated on said first plurality of furnishings the feeling of being in the same room and face-to-face with said remote participant;

characterized in that said plurality of cameras (62, 64) of a first station (12) are situated behind said first side of said screen (46) for capturing a plurality of images at said first station, said plurality of cameras capturing images of different participants situated on said second side of said screen (46), and **in that** said first station (12) further comprises at least one wall 32 (a-h), at least one ceiling (34) and/ or a second plurality of furnishings (50) so that, when the first or second images are being displayed on said screen (46) of said first station (12) participants seated at said first station feel as if they are in the same room with said remote participant of participants.

2. The teleconferencing system as recited in claim 1, wherein said second plurality of furnishings (50) in the first station (12) comprises at least one table having one side associated with said screen (46) and configured to cause said participants to be situated a predetermined distance (B) from said screen.

3. The teleconferencing system as recited in claim 1, wherein said screen (46)of the first station (12) comprises at least one aperture (66, 68), said plurality of cameras (62, 64) are capturing said plurality of images through said at least one aperture.

4. The teleconferencing system as recited in claim 1, wherein said first image comprises at least one remote participant which is substantially life-size when shown on said screen (46) of said first station (12).

5. The teleconferencing system as recited in claim 1, wherein said plurality of cameras (62, 64) of said first station (12) are situated directly in a projection path of said screen (46).

15. A method for teleconferencing in a teleconferencing system (10) having two or more teleconferencing stations (12, 14) remote from each other and being equipped with audio devices (82, 100; 83, 102) and video devices including a plurality of cameras (62, 64) for the exchange of audio and video transmissions between said teleconferencing stations, the method comprising, in each of said stations (12, 14), the steps of:

providing a screen (46) having a first side and a second side said second side being opposite said first side, for displaying a first image of a least one first remote subject and a second image of at least one second remote subject; said at least one first remote subject including a participant who is not included in said at least one second remote subject and said images are not entirely overlaid on top of each other when they are displayed on said screen;
providing a first plurality of furnishings (60) on which participants situated at said teleconferencing station (12,14) may be seated and which are to be placed on said second side of said screen (46);
displaying said first image and said second image on said screen (46) to give participants seated on said first plurality of furnishings the feeling of being in the same room and face-to-face with said remote participant; said method being **characterized by** comprising the further steps of:

situating said plurality of cameras (62, 64) of a first station (12) behind said first side of the screen (46) for capturing a plurality of images at said first station (12), said plurality of cameras capturing images of different participants situated on said second side of said screen of said first station (12);
providing at least one wall (32a-h), at least on ceiling (34) and/or a second pluarlity of furnishings (50) in said first station (12), and
displaying on said screen (46)of said first station at least one of said first image (104) or said second image (106) so that participants seated in said first station (12) feel as if they are in the same room with said remote participant or participants.

7. The method as recited in claim 6, wherein said step of providing said second plurality of furnishings (50) further comprises the step of providing at least one table having one side associated with said screen (46) and configured to cause said participants to be situated a predetermined distance (B) from said screen.

8. The method as recited in claim 6, wherein said screen (46)of said first station (12) is provided with least one aperture (66, 68) and wherein said plurality of cameras (62, 64) situated behind said screen captures said plurality of images through said at least one aperture.

9. The method as recited in claim 6, wherein either said first image or said second image comprises at least one remote participant in substantially life-size when said first image or said second image, respectively, is shown on said screen (46) of said first station (12).

10. The method as recited in claim 6, wherein said method further comprises the step of situating said plurality of cameras (62, 64) directly in a projection path of said screen (46) of said first station (12).

FIG. 1A

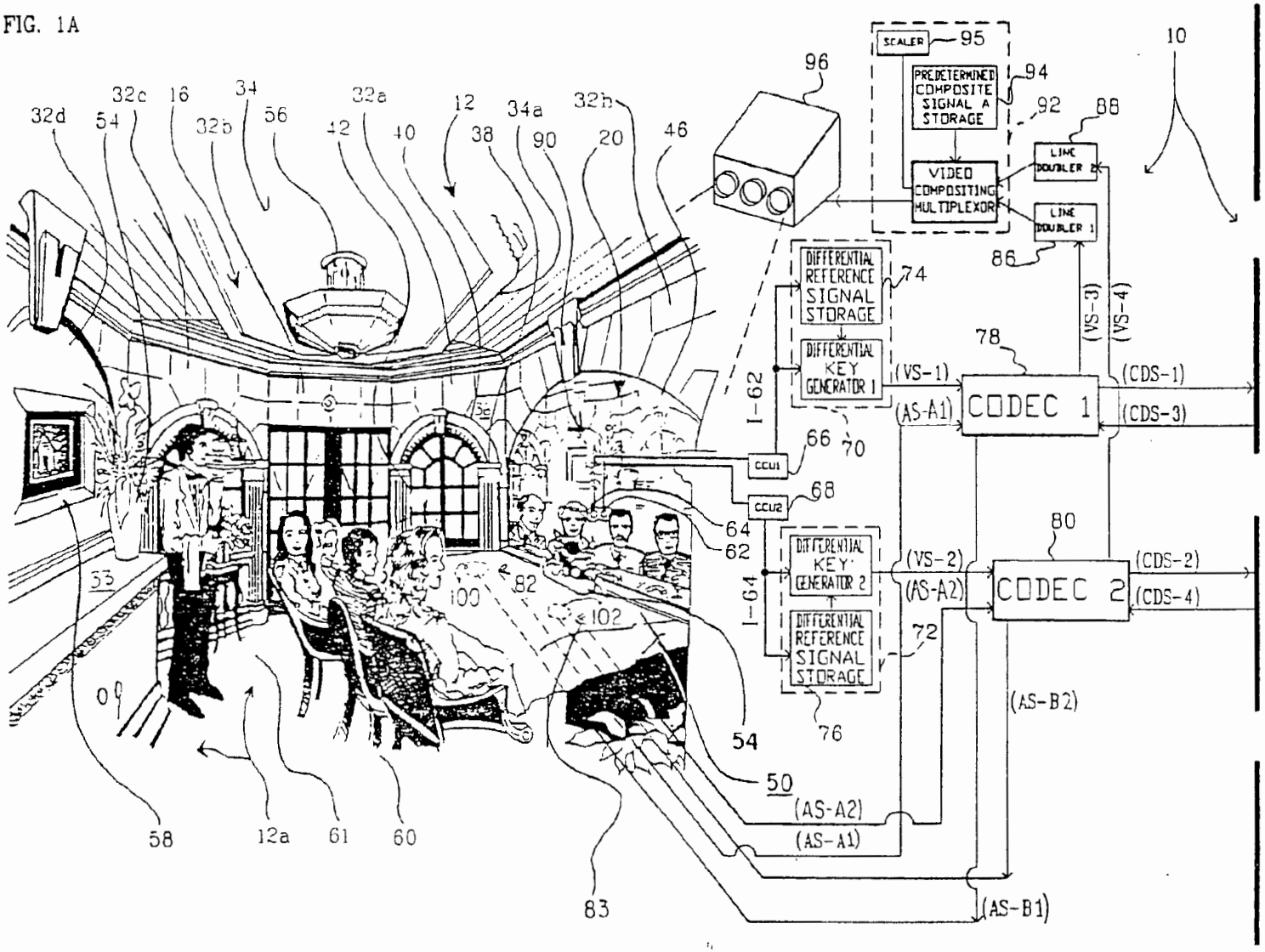

SCALER
95
PREDETERMINED COMPOSITE SIGNAL A STORAGE
94
VIDEO COMPOSITING MULTIPLEXOR
LINE DOUBLER 2
LINE DOUBLER 1
DIFFERENTIAL REFERENCE SIGNAL STORAGE
DIFFERENTIAL KEY GENERATOR 1
DIFFERENTIAL KEY GENERATOR 2
CODEC 1
CODEC 2
CCU1
CCU2
(VS-1)
(VS-2)
(VS-3)
(VS-4)
(AS-A1)
(AS-A2)
(AS-B1)
(AS-B2)
(CDS-1)
(CDS-2)
(CDS-3)
(CDS-4)
I-62
I-64
10
12
12a
16
32a
32b
32c
32d
34
34a
38
40
42
46
50
53
54
56
58
60
61
62
64
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78
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82
83
86
88
90
92
96
100
102

FIG. 1B

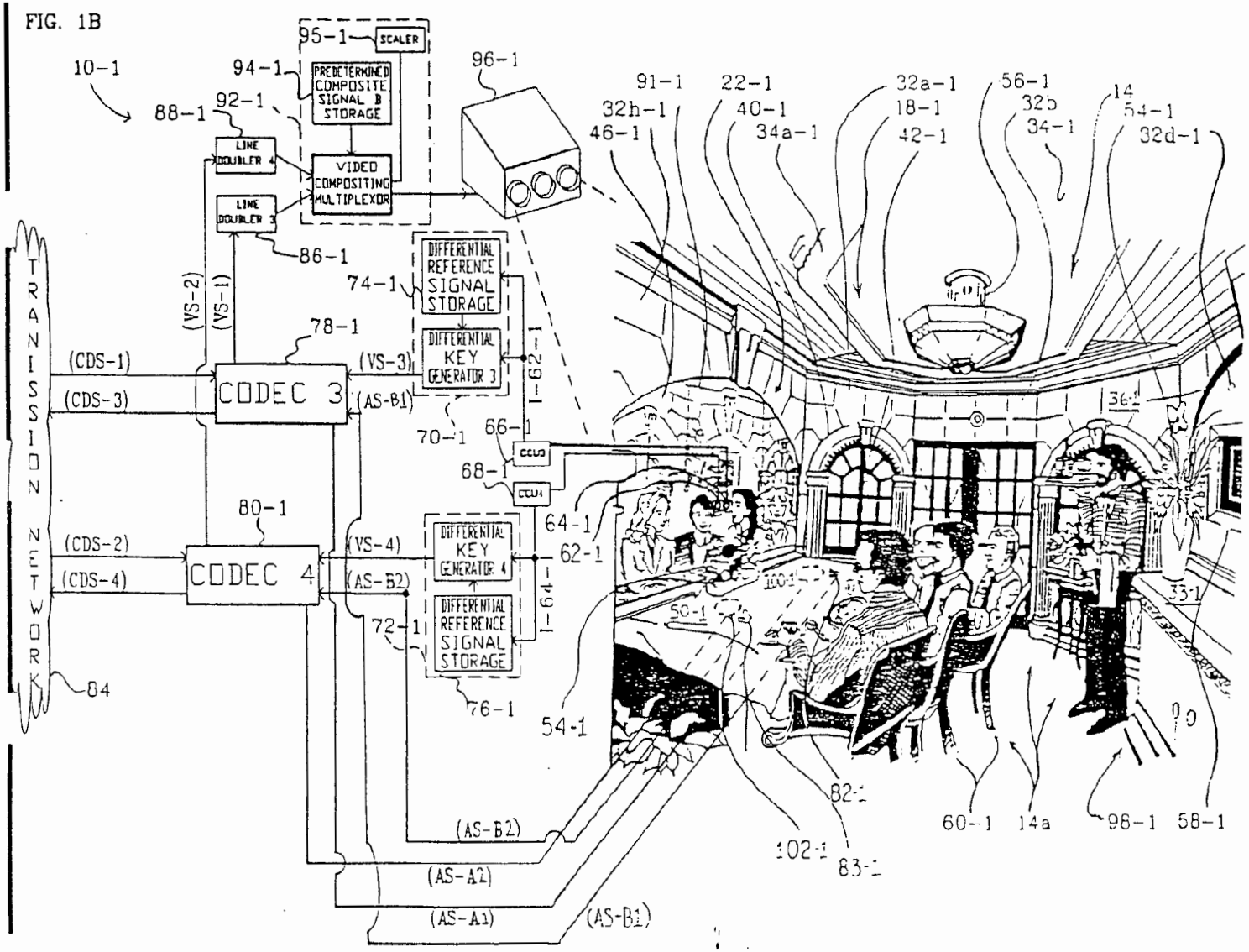

10-1
88-1
92-1
94-1
95-1
SCALER
PREDETERMINED COMPOSITE SIGNAL B STORAGE
VIDEO COMPOSITING MULTIPLEXOR
LINE DOUBLER 4
LINE DOUBLER 3
86-1
96-1
91-1
32h-1
46-1
22-1
40-1
34a-1
32a-1
18-1
42-1
56-1
32b
34-1
14
54-1
32d-1
TRANSMISSION NETWORK
84
(VS-2)
(VS-1)
74-1
DIFFERENTIAL REFERENCE SIGNAL STORAGE
DIFFERENTIAL KEY GENERATOR 3
62-1
78-1
(CDS-1)
(CDS-3)
CODEC 3
(VS-3)
(AS-B1)
70-1
66-1
68-1
CCU3
CCU4
80-1
(CDS-2)
(CDS-4)
CODEC 4
(VS-4)
(AS-B2)
DIFFERENTIAL KEY GENERATOR 4
64-1
62-1
72-1
DIFFERENTIAL REFERENCE SIGNAL STORAGE
64-1
76-1
54-1
36-1
33-1
50-1
82-1
60-1
14a
98-1
58-1
102-1
83-1
(AS-B2)
(AS-A2)
(AS-A1)
(AS-B1)

FIG. 2

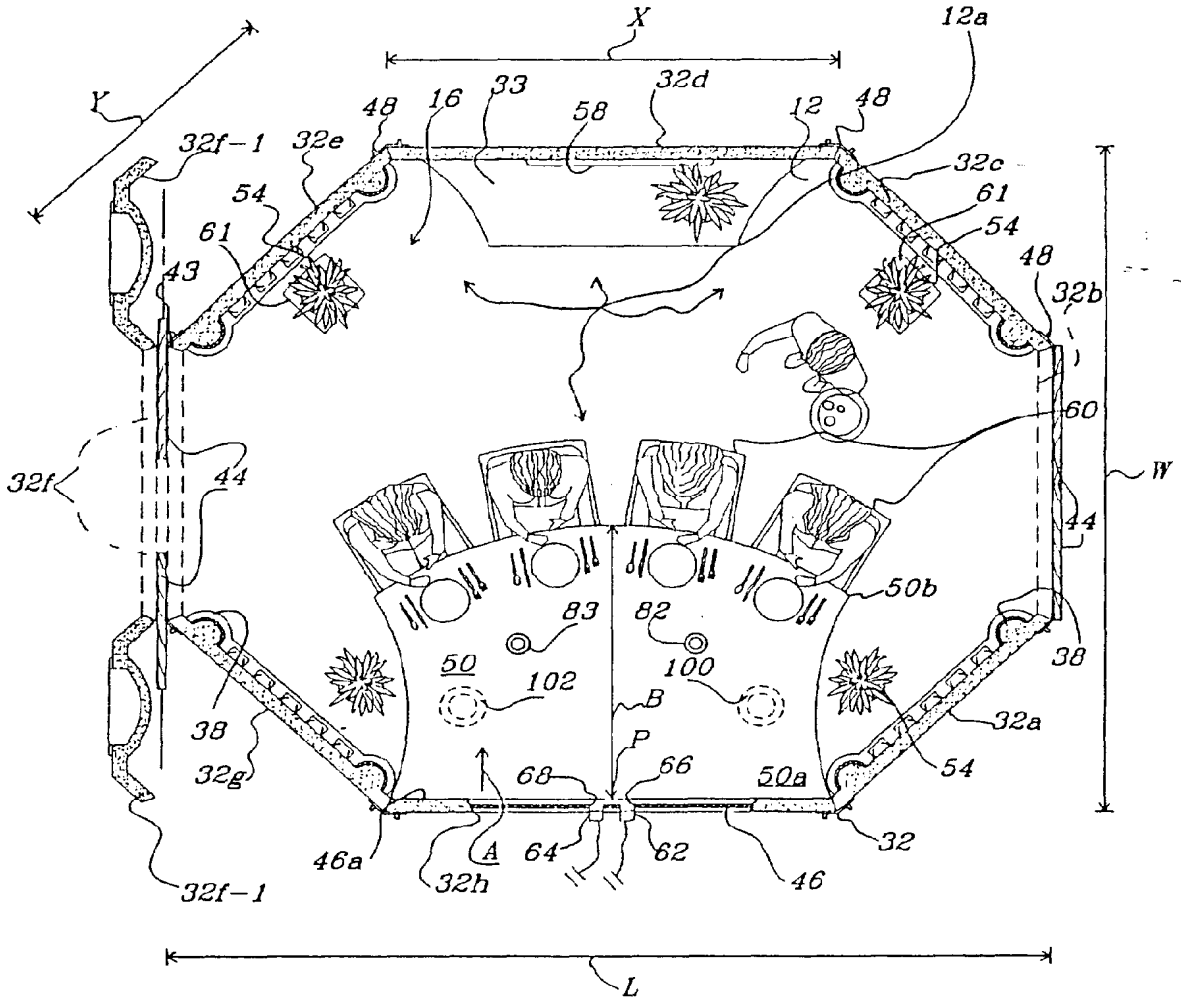
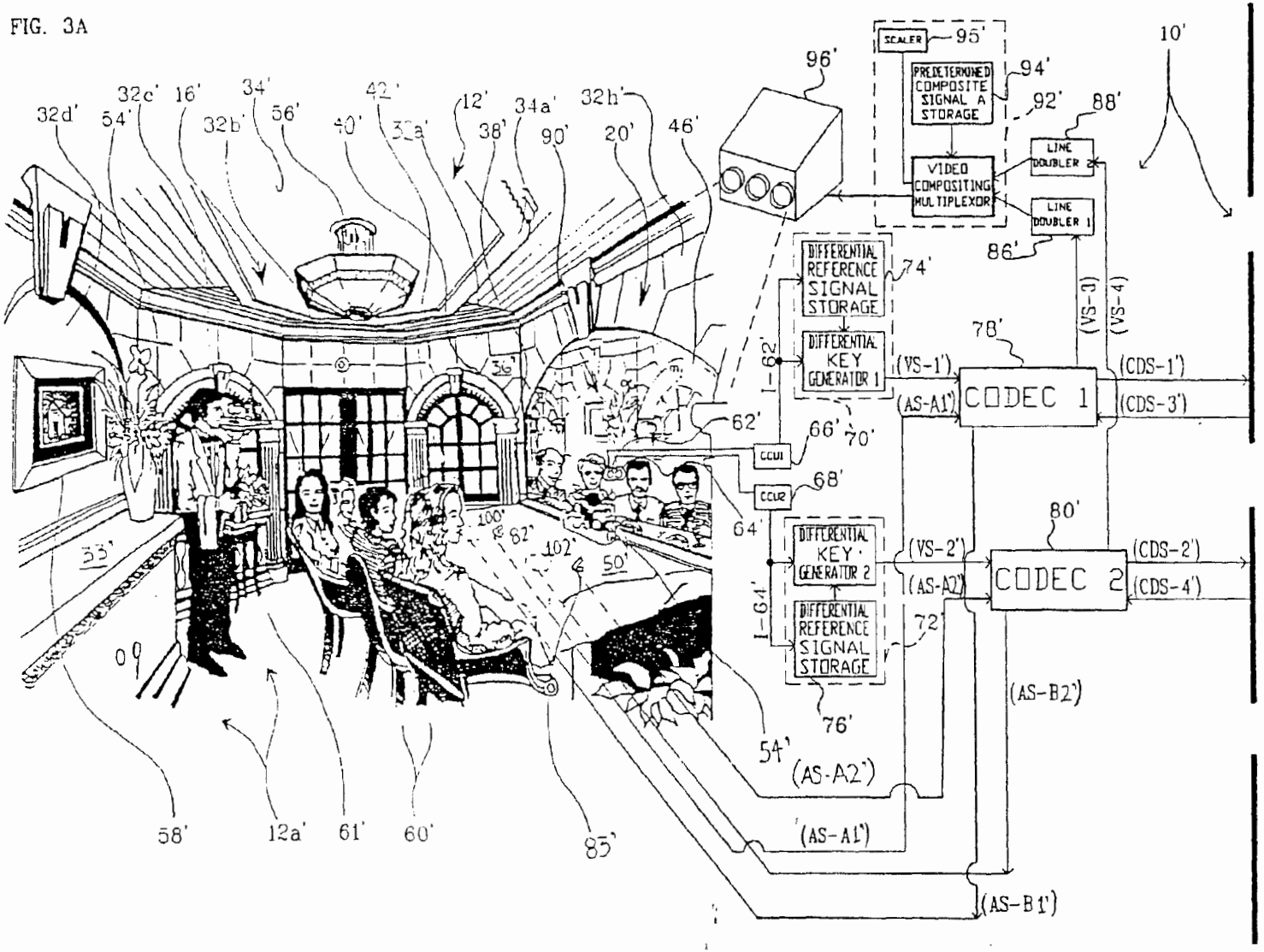

X
Y
12a
32d
33
16
48
58
12
48
32f-1
32e
54
61
43
32c
61
54
48
32b
60
W
32f
44
44
50b
83
82
38
50
102
100
B
P
38
32g
68
66
50a
54
32a
A
64
62
46a
32h
46
32
32f-1
L

FIG. 3A



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FIG. 3B

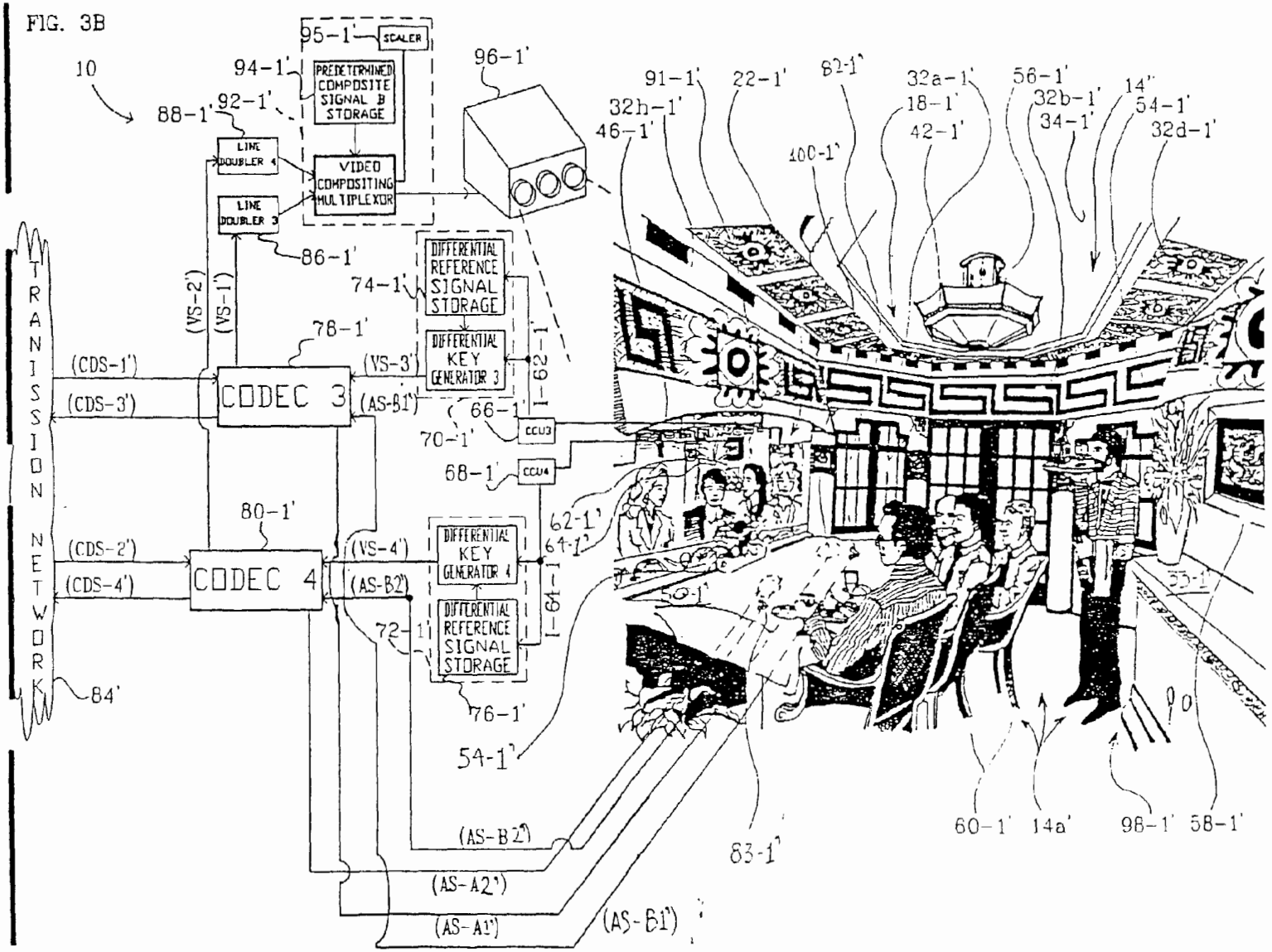
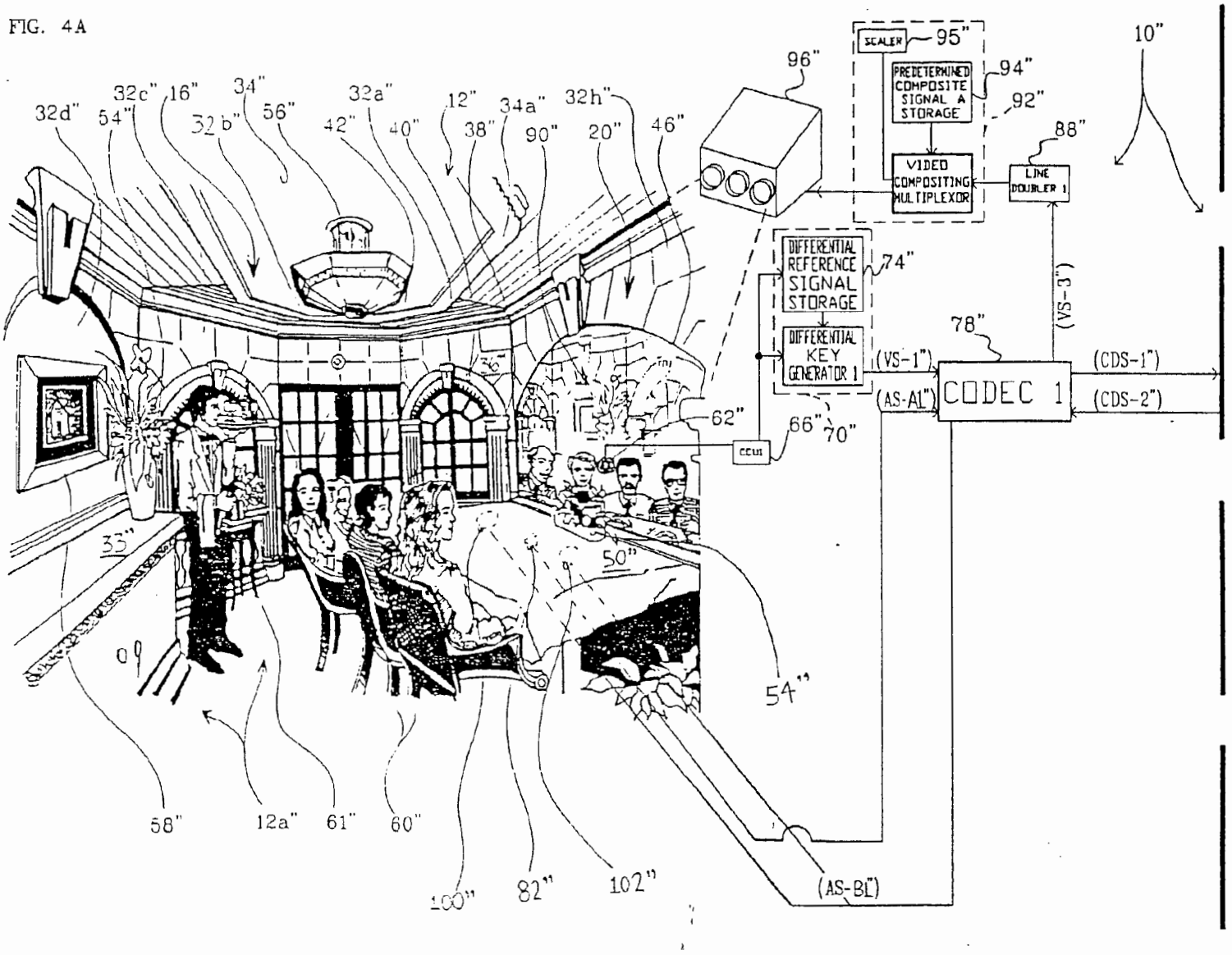

10
95-1'
SCALER
94-1'
PREDETERMINED COMPOSITE SIGNAL B STORAGE
96-1'
88-1'
92-1'
LINE DOUBLER 4
VIDEO COMPOSITING MULTIPLEXOR
LINE DOUBLER 3
86-1'
91-1'
22-1'
82-1'
32a-1'
56-1'
32h-1'
46-1'
18-1'
32b-1'
14'
54-1'
42-1'
34-1'
32d-1'
100-1'
DIFFERENTIAL REFERENCE SIGNAL STORAGE
74-1'
DIFFERENTIAL KEY GENERATOR 3
62-1'
78-1'
(VS-2')
(VS-1')
(VS-3')
(CDS-1')
(CDS-3')
CODEC 3
(AS-B1')
66-1'
CCU3
70-1'
68-1'
CCU4
TRANSMISSION NETWORK
80-1'
(CDS-2')
(CDS-4')
CODEC 4
(VS-4')
(AS-B2')
DIFFERENTIAL KEY GENERATOR 4
64-1'
62-1'
DIFFERENTIAL REFERENCE SIGNAL STORAGE
72-1'
76-1'
84'
54-1'
(AS-B2')
(AS-A2')
(AS-A1')
(AS-B1')
83-1'
60-1'
14a'
98-1'
58-1'

FIG. 4A



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FIG. 4B

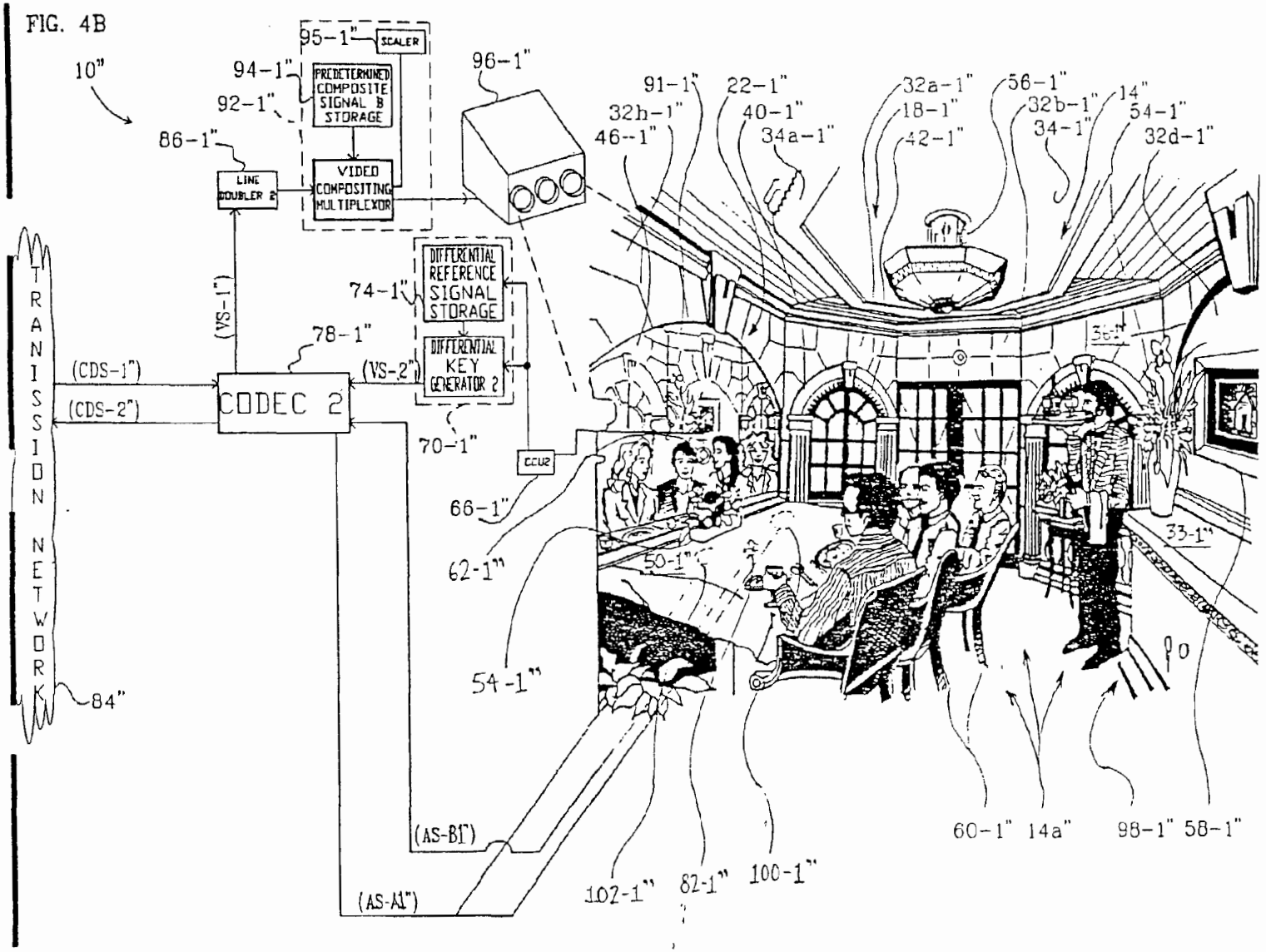

10"
95-1"
SCALER
94-1"
PREDETERMINED COMPOSITE SIGNAL B STORAGE
92-1"
86-1"
LINE DOUBLER 2
VIDEO COMPOSITING MULTIPLEXOR
96-1"
91-1"
32h-1"
46--1"
22-1"
40-1"
34a-1"
32a-1"
18-1"
42-1"
56-1"
32b-1"
34-1"
14"
54-1"
32d-1"
DIFFERENTIAL REFERENCE SIGNAL STORAGE
74-1"
DIFFERENTIAL KEY GENERATOR 2
78-1"
(VS-1")
(VS-2")
(CDS-1")
(CDS-2")
CODEC 2
70-1"
CCU2
66-1"
62-1"
54-1"
TRANSMISSION NETWORK
84"
50-1"
33-1"
(AS-B1")
(AS-A1")
102-1"
82-1"
100-1"
60-1"
14a"
98-1"
58-1"

FIG. 5A

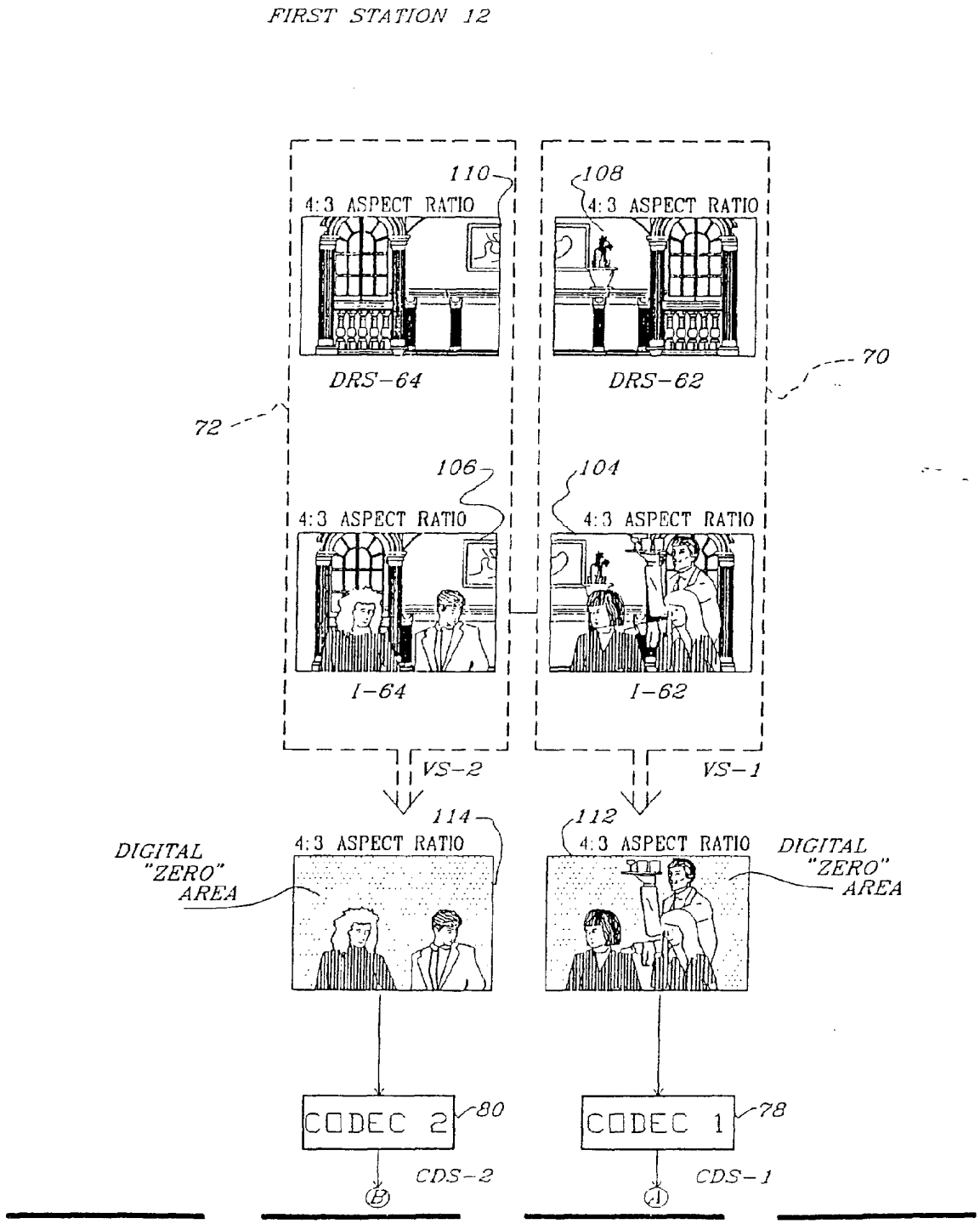

FIRST STATION 12
110
4:3 ASPECT RATIO
108
4:3 ASPECT RATIO
DRS-64
DRS-62
70
72
106
4:3 ASPECT RATIO
104
4:3 ASPECT RATIO
I-64
I-62
VS-2
VS-1
114
4:3 ASPECT RATIO
112
4:3 ASPECT RATIO
DIGITAL "ZERO" AREA
DIGITAL "ZERO" AREA
CODEC 2
80
CODEC 1
78
CDS-2
CDS-1
B
A

FIG. 5B
SECOND STATION 14

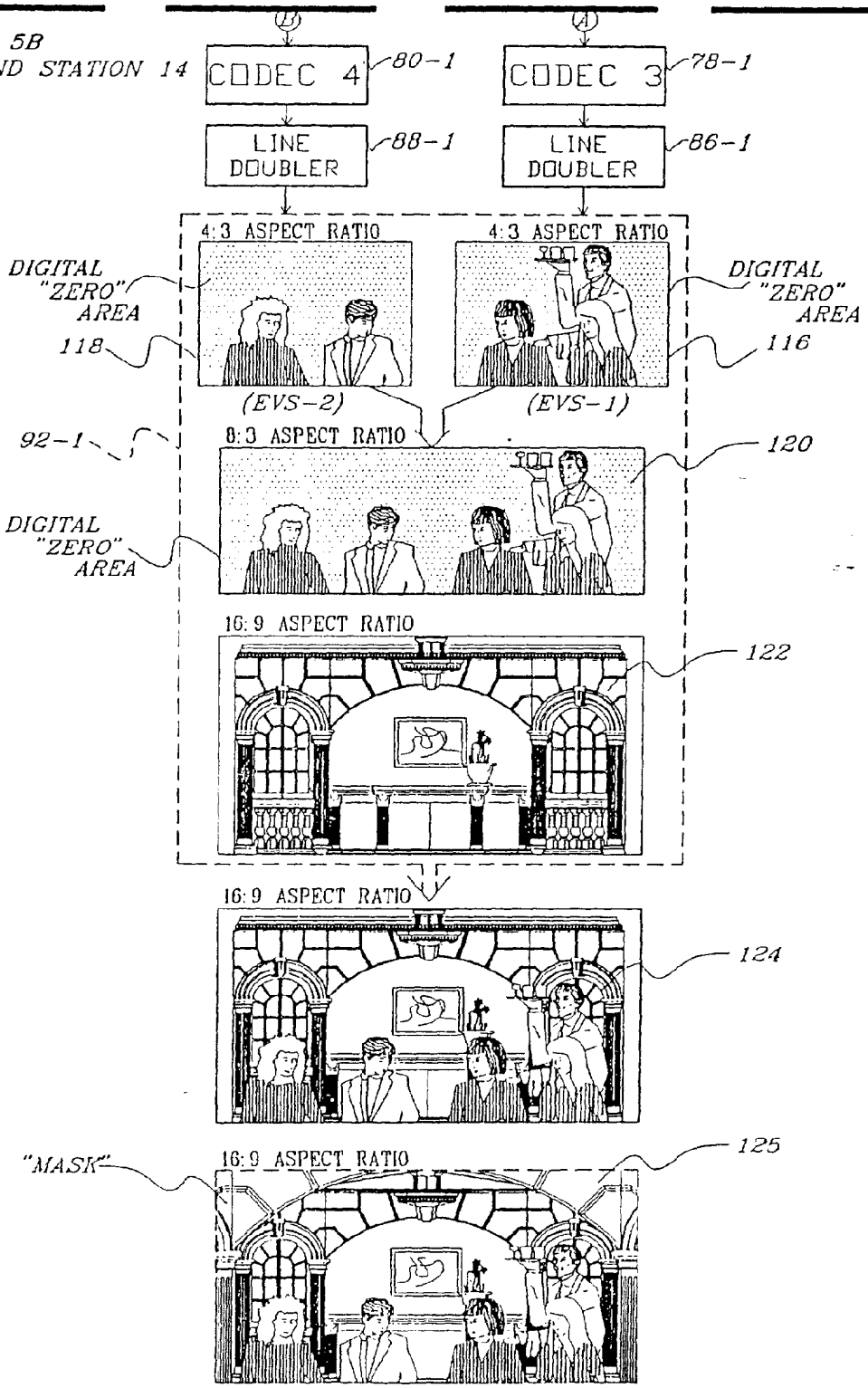


FIG-6A

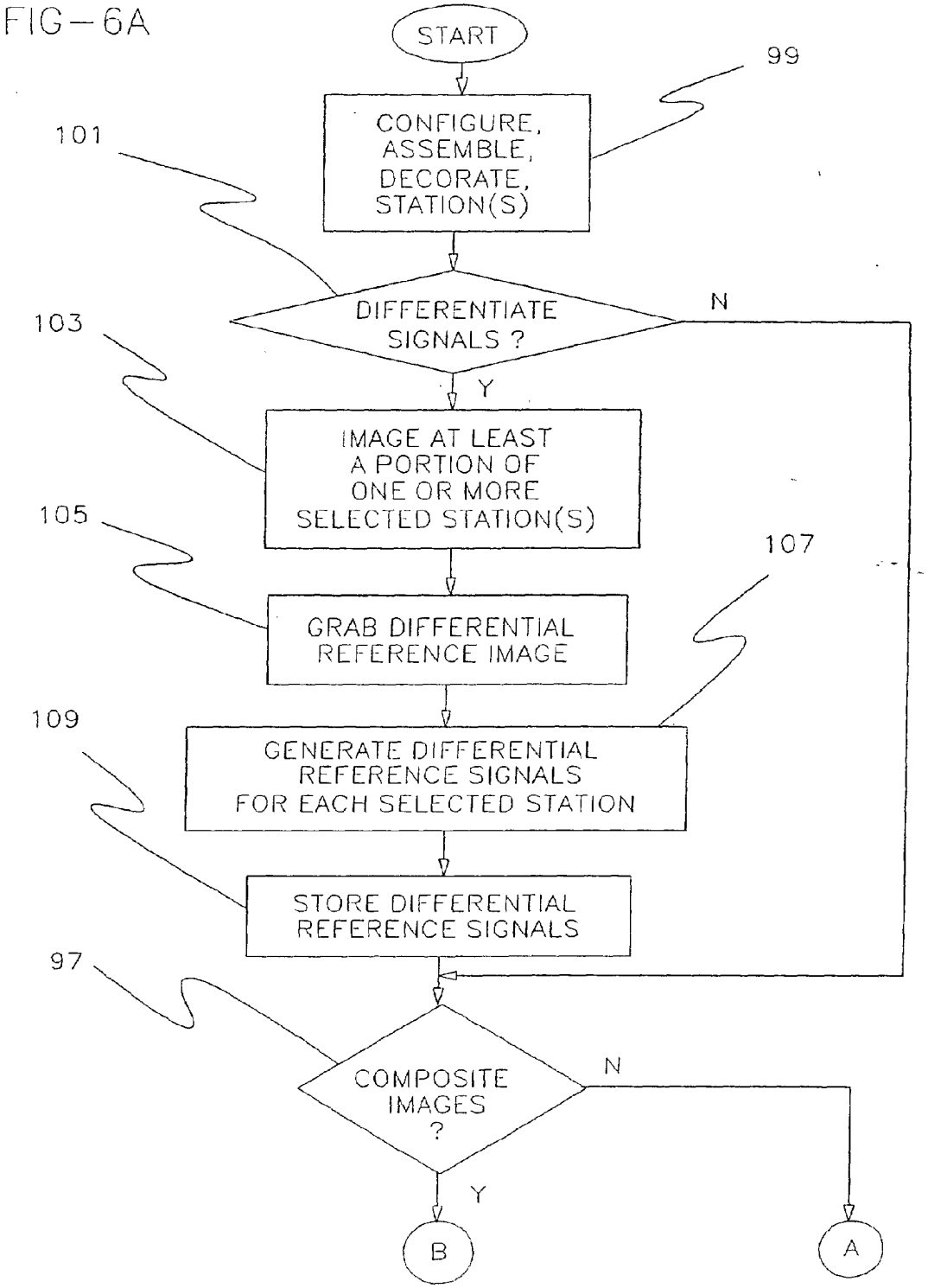

START
99
CONFIGURE, ASSEMBLE, DECORATE, STATION(S)
101
DIFFERENTIATE SIGNALS ?
N
Y
103
IMAGE AT LEAST A PORTION OF ONE OR MORE SELECTED STATION(S)
105
GRAB DIFFERENTIAL REFERENCE IMAGE
107
109
GENERATE DIFFERENTIAL REFERENCE SIGNALS FOR EACH SELECTED STATION
STORE DIFFERENTIAL REFERENCE SIGNALS
97
COMPOSITE IMAGES ?
N
Y
B
A

FIG-6B

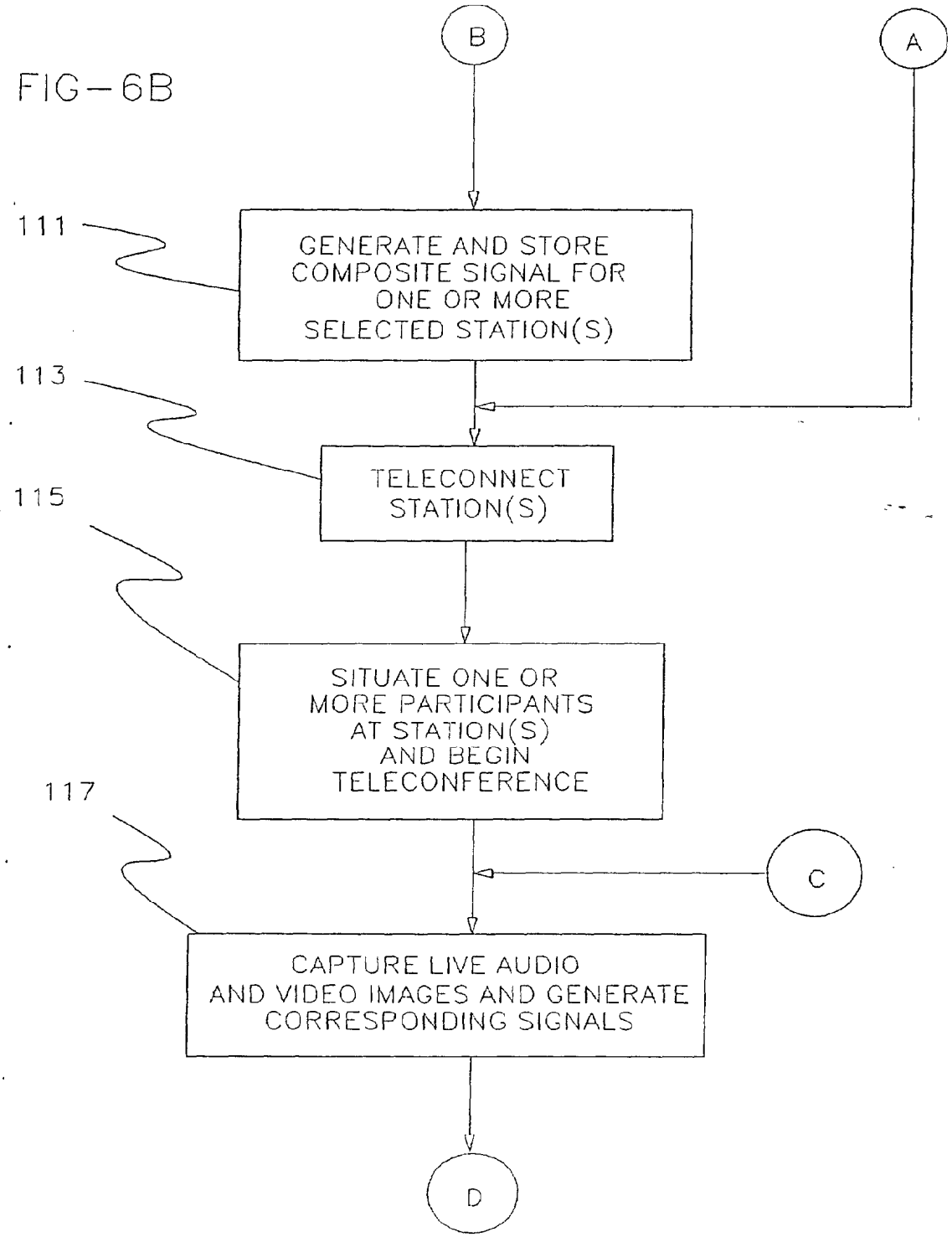

B
A
111
GENERATE AND STORE COMPOSITE SIGNAL FOR ONE OR MORE SELECTED STATION(S)
113
TELECONNECT STATION(S)
115
SITUATE ONE OR MORE PARTICIPANTS AT STATION(S) AND BEGIN TELECONFERENCE
117
C
CAPTURE LIVE AUDIO AND VIDEO IMAGES AND GENERATE CORRESPONDING SIGNALS
D

FIG-6C

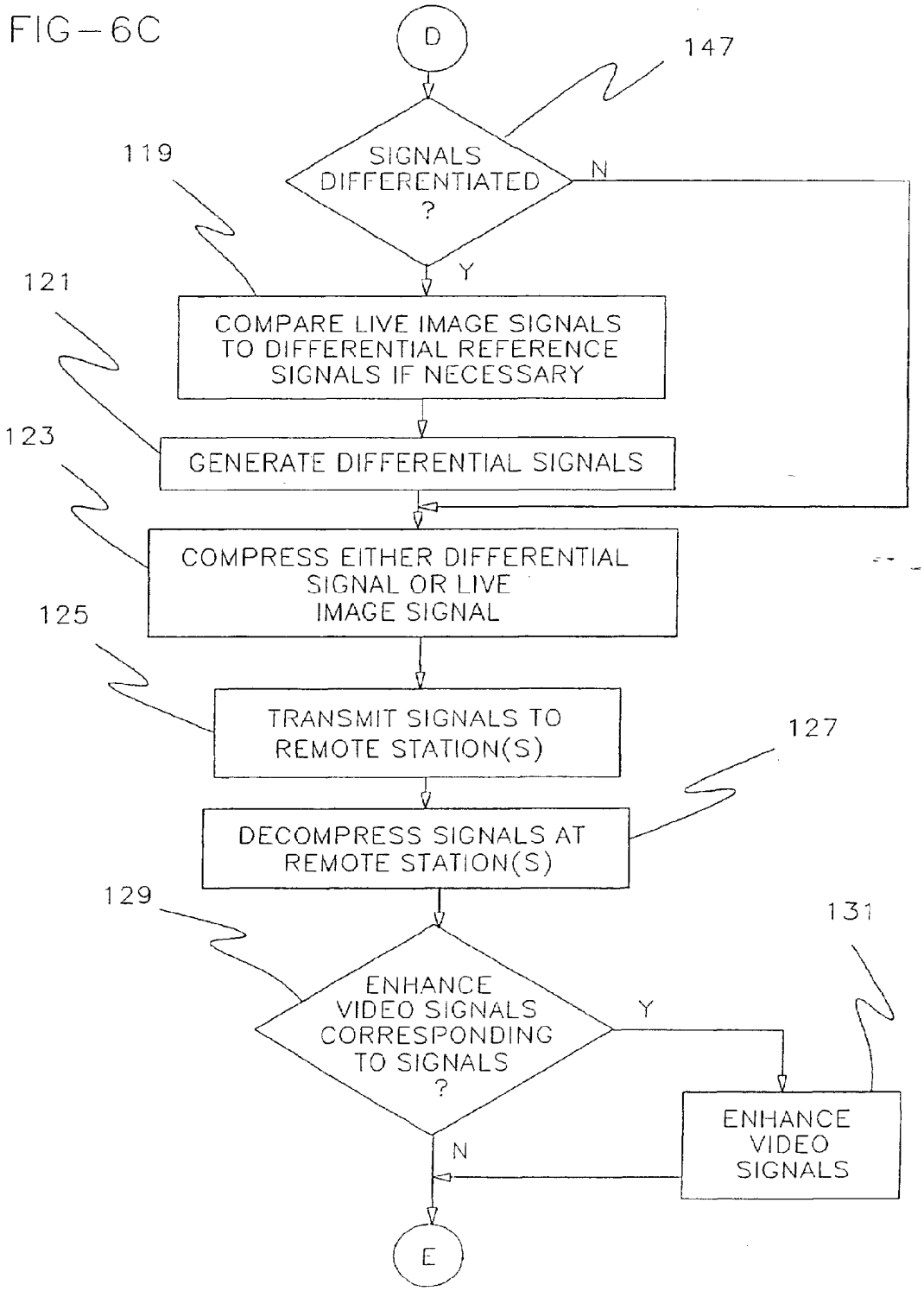
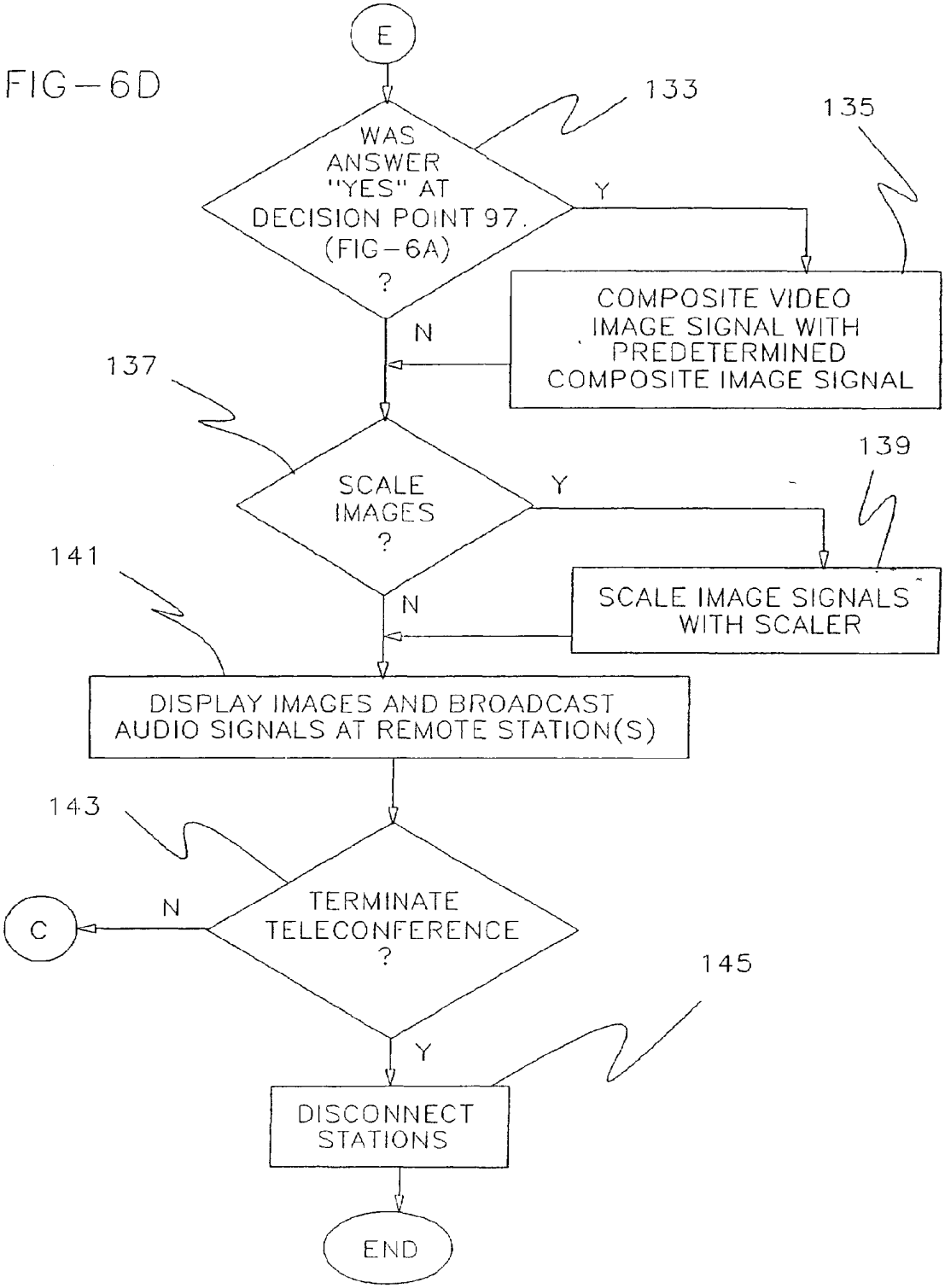

D
147
SIGNALS DIFFERENTIATED ?
N
Y
119
121
COMPARE LIVE IMAGE SIGNALS TO DIFFERENTIAL REFERENCE SIGNALS IF NECESSARY
123
GENERATE DIFFERENTIAL SIGNALS
COMPRESS EITHER DIFFERENTIAL SIGNAL OR LIVE IMAGE SIGNAL
125
TRANSMIT SIGNALS TO REMOTE STATION(S)
127
DECOMPRESS SIGNALS AT REMOTE STATION(S)
129
131
ENHANCE VIDEO SIGNALS CORRESPONDING TO SIGNALS ?
Y
N
ENHANCE VIDEO SIGNALS
E

FIG-6D


E
133
WAS ANSWER "YES" AT DECISION POINT 97. (FIG-6A) ?
Y
135
COMPOSITE VIDEO IMAGE SIGNAL WITH PREDETERMINED COMPOSITE IMAGE SIGNAL
N
137
SCALE IMAGES ?
Y
139
SCALE IMAGE SIGNALS WITH SCALER
N
141
DISPLAY IMAGES AND BROADCAST AUDIO SIGNALS AT REMOTE STATION(S)
143
TERMINATE TELECONFERENCE ?
N
C
Y
145
DISCONNECT STATIONS
END

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 12 8723

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Y	EP 0 459 419 A (SONY CORP) 4 December 1991 (1991-12-04)	1,6	H04N7/15
A	* the whole document *	2-5,7-10	
Y	US 5 187 571 A (BRAUN DAVID A ET AL) 16 February 1993 (1993-02-16)	1,6	
A	* the whole document *	2-5,7-10	
A	PATENT ABSTRACTS OF JAPAN vol. 017, no. 393 (E-1402), 22 July 1993 (1993-07-22) & JP 05 068246 A (NIPPON TELEGR & TELEPH CORP), 19 March 1993 (1993-03-19) * abstract *	1-10	
A	US 5 127 078 A (TERRY JOYCE E ET AL) 30 June 1992 (1992-06-30) * abstract; figure 9 *	1,3,6,8	
A	US 4 928 301 A (SMOOT LANNY S) 22 May 1990 (1990-05-22) * the whole document *	1-10	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)
H04N

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	16 January 2002	Greve, M

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 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 01 12 8723

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
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16-01-2002

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EPO FORM P3459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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European Patent Office
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(54) Markup language and object model for vector graphics

(57) An element object model and a vector graphics markup language for using that element object model in a manner that allows program code developers to consistently interface with a scene graph data structure to produce graphics. The vector graphics element object model generally corresponds to shape elements and other elements including image and video elements that correlate with a scene graph object model of the scene graph. Markup may be parsed into data including elements in an element tree that is translated into the objects of a scene graph data structure. Other markup may be translated directly into data and calls that create the scene graph objects. The markup language provides distinct ways to describe an element, including a simple string format or complex property syntax, which may be named, enabling reuse in other locations in the markup.

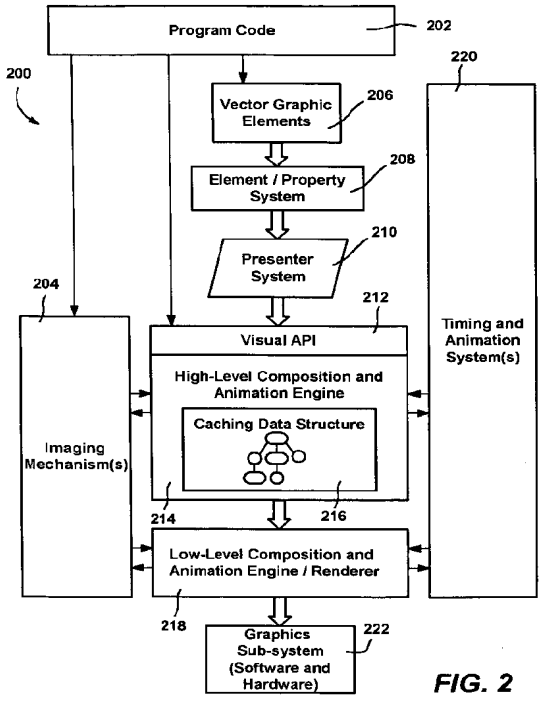


FIG. 2

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present invention is related to the following copending United States Patent Applications: Serial No. 10/184,795 entitled Multiple-Level Graphics Processing System and Method; Serial No. 10/184,796, entitled Generic Parameterization for a Scene Graph; Serial No. 10/185,775 entitled "Intelligent Caching Data Structure for Immediate Mode Graphics;" each filed on June 27, 2002; and United States Patent Application entitled "Visual and Scene Graph Interfaces" (Attorney Docket No. 3470), filed concurrently herewith. Each related application is assigned to the assignee of the present patent application and hereby incorporated by reference in its entirety.

FIELD OF THE INVENTION

[0002] The invention relates generally to computer systems, and more particularly to the processing of graphical and other video information for display on computer systems.

BACKGROUND OF THE INVENTION

[0003] The limits of the traditional immediate mode model of accessing graphics on computer systems are being reached, in part because memory and bus speeds have not kept up with the advancements in main processors and/or graphics processors. In general, the current (e.g., WM_PAINT) model for preparing a frame requires too much data processing to keep up with the hardware refresh rate when complex graphics effects are desired. As a result, when complex graphics effects are attempted with conventional graphics models, instead of completing the changes that result in the perceived visual effects in time for the next frame, the changes may be added over different frames, causing results that are visually and noticeably undesirable.

[0004] A new model for controlling graphics output is described in the aforementioned United States Patent Application Serial Nos. 10/184,795, 10/184,796, and 10/185,775. This new model provides a number of significant improvements in graphics processing technology. For example, U.S. Serial No. 10/184,795 is generally directed towards a multiple-level graphics processing system and method, in which a higher-level component (e.g., of an operating system) performs computationally intensive aspects of building a scene graph, updating animation parameters and traversing the scene graph's data structures, at a relatively low operating rate, in order to pass simplified data structures and/or graphics commands to a low-level component. Because the high-level processing greatly simplifies the data, the low-level component can operate at a faster rate, (relative to the high-level component), such as a rate that corresponds to the frame refresh rate of the graphics subsystem, to process the data into constant output data for the graphics subsystem. When animation is used, instead of having to redraw an entire scene with changes, the low-level processing may interpolate parameter intervals as necessary to obtain instantaneous values that when rendered provide a slightly changed scene for each frame, providing smooth animation.

[0005] U.S. Serial No. 10/184,796 describes a parameterized scene graph that provides mutable (animated) values and parameterized graph containers such that program code that wants to draw graphics (e.g., an application program or operating system component) can selectively change certain aspects of the scene graph description, while leaving other aspects intact. The program code can also reuse already-built portions of the scene graph, with possibly different parameters. As can be appreciated, the ability to easily change the appearance of displayed items via parameterization and/or the reuse of existing parts of a scene graph provide substantial gains in overall graphics processing efficiency.

[0006] U.S. Serial No. 10/185,775 generally describes a caching data structure and related mechanisms for storing visual information via objects and data in a scene graph. The data structure is generally associated with mechanisms that intelligently control how the visual information therein is populated and used. For example, unless specifically requested by the application program, most of the information stored in the data structure has no external reference to it, which enables this information to be optimized or otherwise processed. As can be appreciated, this provides efficiency and conservation of resources, e.g., the data in the cache data structure can be processed into a different format that is more compact and/or reduces the need for subsequent, repeated processing, such as a bitmap or other post-processing result.

[0007] While the above improvements provide substantial benefits in graphics processing technology, there still needs to be a way for programs to effectively use this improved graphics model and its other related improvements in a straightforward manner. What is needed is a comprehensive yet straightforward way for programs to take advantage of the many features and graphics processing capabilities provided by the improved graphics model and thereby output complex graphics in an efficient manner.

SUMMARY OF THE INVENTION

[0008] Briefly, the present invention provides an element object model and a vector graphics markup language for accessing that element object model in a manner that allows program code developers to consistently interface with a scene graph data structure to produce graphics. The vector graphics markup language comprises an interchange format for expressing vector graphics via the element object model. When interpreted, the markup is parsed into data including elements in an element tree that is translated into the objects of a scene graph data structure. At the element tree level, a property system and presenter system are provided to provide rich programmability features, including inheritance characteristics and eventing, making it straightforward for scene designers to design possibly complex scenes. In general, the vector graphics elements correspond to shape elements and other elements including image and video elements that correlate with scene graph objects of the scene graph object model. The properties and other resources of the vector graphics elements also correlate with similar properties and resources the scene graph object model.

[0009] The vector graphics system can thus program to an element level, in which each of the drawing shapes is represented as an element at the same level as the rest of the programmable elements in a page/screen, allowing interaction with the presenter system, events and properties. The vector graphics system also provides a mechanism for programming to a resource level, by which scene designers can essentially shortcut the element tree and presenter system and program directly to the visual API layer that interfaces with the scene graph data structure. This provides a more efficient and lightweight way to output the appropriate object, although losing of some of the programmability of the element level. In one implementation, when a fill of type "visual brush" is programmed, the parser can directly call the API layer with resource level data to create a corresponding visual paint object (which is also a correlation between the element object model and the scene graph object model). In this two-tiered system, element level vector graphics get parsed into created elements, which need later translation to the objects, while resource level vector graphics get parsed and directly stored in an efficient manner. At the same time, the resource level data or the objects created thereby can be referenced by elements and part of the element tree. To this end, elements including visual paint elements may be named. The scene designer thus has the ability to balance efficiency against programmability as needed.

[0010] The element class hierarchy includes a shape class, an image class, a video class and a canvas class. Elements of the shape class include rectangle, polyline, polygon, path, line and ellipse. Each element may include or be associated with fill (property) data, stroke data, clipping data, transform data, filter effect data and mask data. Shapes correspond to geometry (of the scene graph object model) that is drawn with inherited and cascaded presentation properties that are used to construct the pen and the brush needed to draw the shapes. The image class is more specific than a shape and can include more raster graphical data, while the video class allows video (or similar multimedia) to be played within a displayed element. The canvas class may act as a container for shapes, to keep shapes lightweight.

[0011] In one implementation the markup code is interpreted by a parser / translator which generally adds element-level elements to an element tree / property system and attaches presenters to those elements. The presenter system then takes the element tree with the attached presenters and translates the data to objects (via a builder) and calls to a visual API layer that interfaces with the scene graph and creates the scene graph objects.

[0012] The markup language provides distinct ways to describe an element, including a simple string format or a complex object notation (a complex property syntax). For a simple string format, the parser / translator and/or presenter system uses a type converter for converting a string to an appropriate visual API object. When the fill attribute is too complex to fit into a single string, complex property syntax, which may be inline in the markup, is used to describe the property set. Because the same rendering model is shared between the element level and the API level, many of the objects are the same, which makes parsing / translation highly efficient and provides other benefits. A resource instance also may be located elsewhere (e.g., in the markup or a file), and referenced by a name. In this manner, a scene designer can reuse an element in the element tree throughout a scene, including elements described by the complex property syntax.

[0013] Other benefits and advantages will become apparent from the following detailed description when taken in conjunction with the drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

FIGURE 1 is a block diagram representing an exemplary computer system into which the present invention may be incorporated;

FIG. 2 is a block diagram generally representing a graphics layer architecture into which the present invention may

be incorporated;
FIG. 3 is a representation of a scene graph of visuals and associated components for processing the scene graph such as by traversing the scene graph to provide graphics commands and other data in accordance with an aspect of the present invention;
FIG. 4 is a representation of a scene graph of validation visuals, drawing visuals and associated drawing primitives constructed in accordance with an aspect of the present invention;
FIG. 5 is a representation of a visual class, of an object model, in accordance with an aspect of the present invention;
FIG. 6 is a representation of various other objects of the object model, in accordance with an aspect of the present invention;
FIG. 7 is a diagram representing transformation of a visual's data in accordance with an aspect of the present invention;
FIGS. 8A and 8B are representations of transformations of a visual's data in a geometry scale and a non-uniform scale, respectively, in accordance with an aspect of the present invention;
FIGS. 9A-9C are block diagrams of surface visual objects and other visuals and components in accordance with an aspect of the present invention;
FIGS. 10A and 10B are diagrams representing HWnd visual objects in accordance with an aspect of the present invention;
FIG. 11 is a diagram representing a layered visual object in accordance with an aspect of the present invention;
FIG. 12 is a representation of geometry classes of the object model, in accordance with an aspect of the present invention;
FIG. 13 is a representation of a PathGeometry structure, in accordance with an aspect of the present invention;
FIG. 14 is a representation of a scene graph of visuals and drawing primitives showing example graphics produced by the primitives, in accordance with an aspect of the present invention;
FIG. 15 is a representation of brush classes of the object model, in accordance with an aspect of the present invention;
FIG. 16 is a representation of rendered graphics resulting from data in a linear gradient brush object, in accordance with an aspect of the present invention;
FIG. 17 is a representation of rendered graphics resulting from data in a radial gradient brush object, in accordance with an aspect of the present invention;
FIG. 18 is a representation of rendered graphics resulting from having various stretch values, in accordance with an aspect of the present invention;
FIG. 19 is a representation of rendered graphics resulting from having various tile values, in accordance with an aspect of the present invention;
FIG. 20 is a flow diagram generally representing logic for interpreting a visual, including a brush object, to generate graphics in accordance with an aspect of the present invention;
FIG. 21 is a representation of a grid and transformed grid, resulting from data in a visual brush object, in accordance with an aspect of the present invention;
FIG. 22 is a representation of the grid and transformed grid, with rendered graphics therein drawn from a visual, in accordance with an aspect of the present invention;
FIG. 23 is a representation of a rendered nine grid brush object in accordance with an aspect of the present invention;
FIG. 24 is a representation of transform classes of the object model, in accordance with an aspect of the present invention;
FIG. 25 is a representation of element classes of the element object model, in accordance with an aspect of the present invention;
FIG. 26 is a representation of components for interpreting markup language code to interface with the visual API layer, in accordance with an aspect of the present invention; and
FIG. 27 is a representation of clipping via a geometry path in accordance with an aspect of the present invention.

DETAILED DESCRIPTION

EXEMPLARY OPERATING ENVIRONMENT

[0015] FIGURE 1 illustrates an example of a suitable computing system environment 100 on which the invention may be implemented. The computing system environment 100 is only one example of a suitable computing environment and is not intended to suggest any limitation as to the scope of use or functionality of the invention. Neither should the computing environment 100 be interpreted as having any dependency or requirement relating to any one or combination of components illustrated in the exemplary operating environment 100.

[0016] The invention is operational with numerous other general purpose or special purpose computing system environments or configurations. Examples of well known computing systems, environments, and/or configurations that may be suitable for use with the invention include, but are not limited to, personal computers, server computers, hand-held or laptop devices, tablet devices, multiprocessor systems, microprocessor-based systems, set top boxes, programmable consumer electronics, network PCs, minicomputers, mainframe computers, distributed computing environments that include any of the above systems or devices, and the like.

[0017] The invention may be described in the general context of computer-executable instructions, such as program modules, being executed by a computer. Generally, program modules include routines, programs, objects, components, data structures, and so forth, which perform particular tasks or implement particular abstract data types. The invention may also be practiced in distributed computing environments where tasks are performed by remote processing devices that are linked through a communications network. In a distributed computing environment, program modules may be located in both local and remote computer storage media including memory storage devices.

[0018] With reference to FIG. 1, an exemplary system for implementing the invention includes a general purpose computing device in the form of a computer 110. Components of the computer 110 may include, but are not limited to, a processing unit 120, a system memory 130, and a system bus 121 that couples various system components including the system memory to the processing unit 120. The system bus 121 may be any of several types of bus structures including a memory bus or memory controller, a peripheral bus, and a local bus using any of a variety of bus architectures. By way of example, and not limitation, such architectures include Industry Standard Architecture (ISA) bus, Micro Channel Architecture (MCA) bus, Enhanced ISA (EISA) bus, Video Electronics Standards Association (VESA) local bus, Accelerated Graphics Port (AGP) bus, and Peripheral Component Interconnect (PCI) bus also known as Mezzanine bus.

[0019] The computer 110 typically includes a variety of computer-readable media. Computer-readable media can be any available media that can be accessed by the computer 110 and includes both volatile and nonvolatile media, and removable and non-removable media. By way of example, and not limitation, computer-readable media may comprise computer storage media and communication media. Computer storage media includes both volatile and nonvolatile, removable and non-removable media implemented in any method or technology for storage of information such as computer-readable instructions, data structures, program modules or other data. Computer storage media includes, but is not limited to, RAM, ROM, EEPROM, flash memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical disk storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired information and which can accessed by the computer 110. Communication media typically embodies computer-readable instructions, data structures, program modules or other data in a modulated data signal such as a carrier wave or other transport mechanism and includes any information delivery media. The term "modulated data signal" means a signal that has one or more of its characteristics set or changed in such a manner as to encode information in the signal. By way of example, and not limitation, communication media includes wired media such as a wired network or direct-wired connection, and wireless media such as acoustic, RF, infrared and other wireless media. Combinations of the any of the above should also be included within the scope of computer-readable media.

[0020] The system memory 130 includes computer storage media in the form of volatile and/or nonvolatile memory such as read only memory (ROM) 131 and random access memory (RAM) 132. A basic input/output system 133 (BIOS), containing the basic routines that help to transfer information between elements within computer 110, such as during start-up, is typically stored in ROM 131. RAM 132 typically contains data and/or program modules that are immediately accessible to and/or presently being operated on by processing unit 120. By way of example, and not limitation, FIG. 1 illustrates operating system 134, application programs 135, other program modules 136 and program data 137.

[0021] The computer 110 may also include other removable/non-removable, volatile/nonvolatile computer storage media. By way of example only, FIG. 1 illustrates a hard disk drive 141 that reads from or writes to non-removable, nonvolatile magnetic media, a magnetic disk drive 151 that reads from or writes to a removable, nonvolatile magnetic disk 152, and an optical disk drive 155 that reads from or writes to a removable, nonvolatile optical disk 156 such as a CD ROM or other optical media. Other removable/non-removable, volatile/nonvolatile computer storage media that can be used in the exemplary operating environment include, but are not limited to, magnetic tape cassettes, flash memory cards, digital versatile disks, digital video tape, solid state RAM, solid state ROM, and the like. The hard disk drive 141 is typically connected to the system bus 121 through a non-removable memory interface such as interface 140, and magnetic disk drive 151 and optical disk drive 155 are typically connected to the system bus 121 by a removable memory interface, such as interface 150.

[0022] The drives and their associated computer storage media, discussed above and illustrated in FIG. 1, provide storage of computer-readable instructions, data structures, program modules and other data for the computer 110. In FIG. 1, for example, hard disk drive 141 is illustrated as storing operating system 144, application programs 145, other program modules 146 and program data 147. Note that these components can either be the same as or different from

operating system 134, application programs 135, other program modules 136, and program data 137. Operating system 144, application programs 145, other program modules 146, and program data 147 are given different numbers herein to illustrate that, at a minimum, they are different copies. A user may enter commands and information into the computer 110 through input devices such as a tablet (electronic digitizer) 164, a microphone 163, a keyboard 162 and pointing device 161, commonly referred to as mouse, trackball or touch pad. Other input devices (not shown) may include a joystick, game pad, satellite dish, scanner, or the like. These and other input devices are often connected to the processing unit 120 through a user input interface 160 that is coupled to the system bus, but may be connected by other interface and bus structures, such as a parallel port, game port or a universal serial bus (USB). A monitor 191 or other type of display device is also connected to the system bus 121 via an interface, such as a video interface 190. The monitor 191 may also be integrated with a touch-screen panel 193 or the like that can input digitized input such as handwriting into the computer system 110 via an interface, such as a touch-screen interface 192. Note that the monitor and/or touch screen panel can be physically coupled to a housing in which the computing device 110 is incorporated, such as in a tablet-type personal computer, wherein the touch screen panel 193 essentially serves as the tablet 164. In addition, computers such as the computing device 110 may also include other peripheral output devices such as speakers 195 and printer 196, which may be connected through an output peripheral interface 194 or the like.

[0023] The computer 110 may operate in a networked environment using logical connections to one or more remote computers, such as a remote computer 180. The remote computer 180 may be a personal computer, a server, a router, a network PC, a peer device or other common network node, and typically includes many or all of the elements described above relative to the computer 110, although only a memory storage device 181 has been illustrated in FIG. 1. The logical connections depicted in FIG. 1 include a local area network (LAN) 171 and a wide area network (WAN) 173, but may also include other networks. Such networking environments are commonplace in offices, enterprise-wide computer networks, intranets and the Internet.

[0024] When used in a LAN networking environment, the computer 110 is connected to the LAN 171 through a network interface or adapter 170. When used in a WAN networking environment, the computer 110 typically includes a modem 172 or other means for establishing communications over the WAN 173, such as the Internet. The modem 172, which may be internal or external, may be connected to the system bus 121 via the user input interface 160 or other appropriate mechanism. In a networked environment, program modules depicted relative to the computer 110, or portions thereof, may be stored in the remote memory storage device. By way of example, and not limitation, FIG. 1 illustrates remote application programs 185 as residing on memory device 181. It will be appreciated that the network connections shown are exemplary and other means of establishing a communications link between the computers may be used.

GRAPHICS ARCHITECTURE

[0025] One aspect of the present invention is generally directed to allowing program code, such as an application or operating system component, to communicate drawing instructions and other information (e.g., image bitmaps) to graphics components in order to render graphical output on the system display. To this end, the present invention provides a markup language along with a set of shape elements and other elements, a grouping and compositing system, and integration with a general property system in an object model to enable programs to populate a scene graph with data structures, drawing primitives (commands), and other graphics-related data. When processed, the scene graph results in graphics being displayed on the screen.

[0026] FIG. 2 represents a general, layered architecture 200 into which the present invention may be implemented. As represented in FIG. 2, program code 202 (e.g., an application program or operating system component or the like) may be developed to output graphics data in one or more various ways, including via imaging 204, via vector graphic elements 206, and/or via function / method calls placed directly to a visual application programming interface (API) layer 212. Direct interaction with the API layer is further described in the aforementioned copending patent application entitled "Visual and Scene Graph Interfaces."

[0027] In general, imaging 204 provides the program code 202 with a mechanism for loading, editing and saving images, e.g., bitmaps. These images may be used by other parts of the system, and there is also a way to use the primitive drawing code to draw to an image directly.

[0028] In accordance with an aspect of the present invention, vector graphics elements 206 provide another way to draw graphics, consistent with the rest of the object model (as described below). Vector graphic elements 206 may be created via a markup language, which an element / property system 208 and presenter system 210 processes to make appropriate calls to the visual API layer 212. As described below with reference to FIG. 26, in general the vector graphic elements 206 are parsed into objects of the object model from which a scene graph is drawn, which may be provided to the scene graph via an element level via the element / property system 208 and presenter system 210, or may be provided in a more efficient manner at a resource level, as also described below.

[0029] In one implementation, the graphics layer architecture 200 includes a high-level composition and animation

engine 214, which includes or is otherwise associated with a caching data structure 216. The caching data structure 216 contains a scene graph comprising hierarchically-arranged objects that are managed according to a defined object model, as described below. In general, the visual API layer 212 provides the program code 202 (and the presenter system 210) with an interface to the caching data structure 216, including the ability to create objects, open and close objects to provide data to them, and so forth. In other words, the high-level composition and animation engine 214 exposes a unified media API layer 212 by which developers may express intentions about graphics and media to display graphics information, and provide an underlying platform with enough information such that the platform can optimize the use of the hardware for the program code. For example, the underlying platform will be responsible for caching, resource negotiation and media integration.

[0030] In one implementation, the high-level composition and animation engine 214 passes an instruction stream and possibly other data (e.g., pointers to bitmaps) to a fast, low-level compositing and animation engine 218. As used herein, the terms "high-level" and "low-level" are similar to those used in other computing scenarios, wherein in general, the lower a software component is relative to higher components, the closer that component is to the hardware. Thus, for example, graphics information sent from the high-level composition and animation engine 214 may be received at the low-level compositing and animation engine 218, where the information is used to send graphics data to the graphics subsystem including the hardware 222.

[0031] The high-level composition and animation engine 214 in conjunction with the program code 202 builds a scene graph to represent a graphics scene provided by the program code 202. For example, each item to be drawn may be loaded with drawing instructions, which the system can cache in the scene graph data structure 216. As will be described below, there are a number of various ways to specify this data structure 216, and what is drawn. Further, the high-level composition and animation engine 214 integrates with timing and animation systems 220 to provide declarative (or other) animation control (e.g., animation intervals) and timing control. Note that the animation system allows animate values to be passed essentially anywhere in the system, including, for example, at the element property level 208, inside of the visual API layer 212, and in any of the other resources. The timing system is exposed at the element and visual levels.

[0032] The low-level compositing and animation engine 218 manages the composing, animating and rendering of the scene, which is then provided to the graphics subsystem 222. The low-level engine 218 composes the renderings for the scenes of multiple applications, and with rendering components, implements the actual rendering of graphics to the screen. Note, however, that at times it may be necessary and/or advantageous for some of the rendering to happen at higher levels. For example, while the lower layers service requests from multiple applications, the higher layers are instantiated on a per-application basis, whereby is possible via the imaging mechanisms 204 to perform time-consuming or application-specific rendering at higher levels, and pass references to a bitmap to the lower layers.

SCENE GRAPH OBJECT MODEL

[0033] As described below, the rendering model is shared by the higher-level, control-based vector graphics elements 206, and the lower-level objects created by the visual API layer 212 used in the scene graph data structure 216. This provides a significant amount of correlation between the higher-level elements of the present invention, and the lower-level objects. The following describes one implementation of the scene graph object model.

[0034] FIGS. 3 and 4 show example scene graphs 300 and 400, respectively, including a base object referred to as a visual. In general, a visual comprises an object that represents a virtual surface to the user and has a visual representation on the display. As represented in FIG. 5, a base class visual provides the base functionality for other visual types, that is, the visual class 500 is an abstract base class from which visual types (e.g., 501-506) derive.

[0035] As represented in FIG. 3, a top-level (or root) visual 302 is connected to a visual manager object 304, which also has a relationship (e.g., via a handle) with a window (HWnd) 306 or similar unit in which graphic data is output for the program code. The VisualManager 304 manages the drawing of the top-level visual (and any children of that visual) to that window 306. FIG. 6 shows the VisualManager as one of a set of other objects 620 in the object model of the graphics system described herein.

[0036] To draw, the visual manager 304 processes (e.g., traverses or transmits) the scene graph as scheduled by a dispatcher 308, and provides graphics instructions and other data to the low level component 218 (FIG. 2) for its corresponding window 306, such as generally described in U.S. Patent Application Serial Nos. 10/184,795, 10/184,796, and 10/185,775. The scene graph processing will ordinarily be scheduled by the dispatcher 308 at a rate that is relatively slower than the refresh rate of the lower-level component 218 and/or graphics subsystem 222. FIG. 3 shows a number of child visuals 310-315 arranged hierarchically below the top-level (root) visual 302, some of which are represented as having been populated via drawing contexts 316, 317 (shown as dashed boxes to represent their temporary nature) with associated instruction lists 318 and 319, respectively, e.g., containing drawing primitives and other visuals. The visuals may also contain other property information, as shown in the following example visual class:

```
public abstract class Visual : VisualComponent
 {
     public Transform Transform { get; set; }
     public float Opacity { get; set; }
     public BlendMode BlendMode { get; set; }
     public Geometry Clip { get; set; }
     public bool Show { get; set; }
     public HitTestResult HitTest(Point point);
     public bool IsDescendant(Visual visual);
     public static Point TransformToDescendant(
         Visual reference,
         Visual descendant,
         Point point);
     public static Point TransformFromDescendant(
         Visual reference,
         Visual descendant,
         Point point);
     public Rect CalculateBounds(); // Loose bounds
     public Rect CalculateTightBounds(); //
     public bool HitTestable { get; set; }
     public bool HitTestIgnoreChildren { get; set; }
     public bool HitTestFinal { get; set; }
 }
```

[0037] A transformation, set by the transform property, defines the coordinate system for the sub-graph of a visual. The coordinate system before the transformation is called pre-transform coordinate system, the one after the transform is called post-transform coordinate system, that is, a visual with a transformation is equivalent to a visual with a transformation node as a parent. FIG. 7 generally provides an example of transformation, identifying the pre-transformation and post-transformation coordinate systems relative to a visual. To get or set the transformation of a visual, the Transform property may be used.

[0038] Note that the coordinate transforms may be applied in a uniform way to everything, as if it were in a bitmap. Note that this does not mean that transformations always apply to bitmaps, but that what gets rendered is affected by transforms equally. By way of example, if the user draws a circle with a round pen that is one inch wide and then applies a scale in the X direction of two to that circle, the pen will be two inches wide at the left and right and only one inch wide at the top and bottom. This is sometimes referred to as a compositing or bitmap transform (as opposed to a skeleton or geometry scale that affects the geometry only). FIG. 8A is a representation of scaling transformation, with a non-transformed image 800 appearing on the left and a transformed image 802 with a non-uniform scale appearing on the right. FIG. 8B is a representation of scaling transformation, with the non-transformed image 800 appearing on the left and a transformed image 804 with geometry scaling appearing on the right.

[0039] With respect to coordinate transformation of a visual, TransformToDescendant transforms a point from the reference visual to a descendant visual. The point is transformed from the post-transformation coordinate space of the reference visual to the post-transformation coordinate space of the descendant visual. TransformFromDescendant transforms a point from the descendant visual up the parent chain to the reference visual. The point is transformed from post-transformation coordinate space of the descendant visual to post-transformation coordinate space of the reference visual. The CalculateBounds method returns the bounding box of the content of the Visual in Post-Transformation coordinate space. Note that there may be an alternative version of the API where more specific specifications are allowed as to how the transform on a visual is interpreted during a coordinate transformation. For example, the transform on the reference and descendant visual may or may not be taken into account. In this alternative, there are thus four options, e.g., coordinates can be transformed from pre-transformation to pre-transformation space, pre-transformation to post-transformation space, post-transformation to pre-transformation space, and post-transformation to post-transformation space. The same concept applies to hit-testing, e.g., hit-testing may be started in pre-transformation or post-transformation transform coordinate space, and the hit-test results might be in pre-transformation or post-transformation coordinate space.

[0040] The clip property sets (and gets) the clipping region of a visual. Any Geometry (the geometry class is described below with reference to FIG. 12) can be used as a clipping region, and the clipping region is applied in Post-Transfor-

mation coordinate space. In one implementation, a default setting for the clipping region is null, i.e., no clipping, which can be thought of as an infinite big clipping rectangle from (-∞, -∞) to (+∞, +∞) .

[0041] The Opacity property gets/sets the opacity value of the visual, such that the content of the visual is blended on the drawing surface based on the opacity value and the selected blending mode. The BlendMode property can be used to set (or get) the blending mode that is used. For example, an opacity (alpha) value may be set between 0.0 and 1.0, with linear alpha blending set as the mode, e.g., Color = alpha * foreground color + (1.0-alpha) * background color). Other services, such as special effects properties, may be included in a visual, e.g., blur, monochrome, and so on.

[0042] The various services (including transform, opacity, clip) can be pushed and popped on a drawing context, and push/ pop operations can be nested, as long as a pop call matches a push call. For example PushTransform(...); PushOpacity (...) ; PopTransform(...); is illegal, because before the PopTransform call, PopOpacity needs to be called.

[0043] The PushTransform method pushes a transformation. Subsequent drawing operations are executed with respect to the pushed transformation. The PopTransform pops the transformation pushed by the matching PushTransform call:

```
void PushTransform(Transform transform);
void PushTransform(Matrix matrix);
void PopTransform();.
```

[0044] Similarly, the PushOpacity method pushes an opacity value. Subsequent drawing operations are rendered on a temporary surface with the specified opacity value and then composite into the scene. PopOpacity pops the opacity pushed by the matching PushOpacity call:

```
void PushOpacity(float opacity);
void PushOpacity(NumberAnimationBase opacity);
void PopOpacity();.
```

[0045] The PushClip method pushes a clipping geometry. Subsequent drawing operations are clipped to the geometry. The clipping is applied in post transformation space. PopClip pops the clipping region pushed by the matching PushClip call:

```
void PushClip(Geometry clip);
void PopClip();.
```

[0046] Note that push operations can be arbitrarily nested as long as the pop operations are matched with a push. For example, the following is valid:

```
PushTransform(...);
DrawLine(...);
PushClip(...);
DrawLine(...);
PopClip();
PushTransform(...);
DrawRect(...);
PopTransform();
PopTransform();
```

[0047] Hit-testing is performed in the Post-Transformation coordinate space, and returns an identity of each hit-testable visual that is hit, e.g., when a pen or mouse click is detected. An alternate version of the interface may allow for hit-testing to start at a Pre-Transformation coordinate space relative to the visual where the hit test is started. Visuals that are hit are returned in right-to-left, depth-first order. Hit-testing may be controlled with various flags, including HitTestable, which determines if the visual is hit-testable (the default is true), and HitTestFinal, which determines if hit-testing stops when the visual is hit, i.e. if a Visual is hit and the HitTestFinal property of the visual is true, hit-testing aborts and returns the results collected up to this point (the default is false). Another flag is HitTestIgnoreChildren, which determines if the children of a visual should be considered when hit-testing is performed on a visual (the default is false).

[0048] A ProxyVisual is a visual that may be added more than once into the scene graph. Since any visual referred

to by a ProxyVisual may be reached by multiple paths from the root, read services (TransformToDescendent, TransformFromDescendent and HitTest) do not work through a ProxyVisual. In essence, there is one canonical path from any visual to the root of the visual tree and that path does not include any ProxyVisuals.

[0049] As represented in FIG. 5, various types of visuals are defined in the object model, including ContainerVisuals 501, DrawingVisuals 502, ValidationVisuals 503, SurfaceVisuals 504 and HwndVisuals 505. The table below sets forth example methods of a DrawingVisual:

```
public class DrawingVisual : Visual
{
    public DrawingVisual();
    public IDrawingContext Open();
    public IDrawingContext Append();
}
```

[0050] A DrawingVisual is a container for graphical content (e.g. lines, text, images, and so forth). Note that it is possible to add a Visual into a DrawingVisual, but in some implementations this is not allowed. The DrawingVisual 502 includes an Open method, which returns an IDrawingContext that can be used to populate the DrawingVisual, e.g., with other visuals and drawing primitives, as described below. In one implementation, for various reasons also described below, a DrawingVisual may be only opened once to populate its drawing context; in other words, such a DrawingVisual is immutable. After the DrawingVisual has been populated, the DrawingVisual is closed using a Close method, e.g., on the drawing context. Note that an Open call may clear any contents (children) of a visual, however in one alternative implementation, there is provided an Append method, to open a current visual in a manner that appends to that visual. In other words, an OpenForAppend call works like Open, except the current content of the DrawingVisual is not cleared out on the open.

[0051] The following is an example of how a drawing context is used to populate a visual:

```
ContainerVisual cv1 = new ContainerVisual();
DrawingVisual dv1 = new DrawingVisual();
```

```
// Open a drawing context.  The context
// will automatically be closed when
// exiting the using block.  This will also
// replace any contents that might already
// be in dv1.
using (IDrawingContext dc = dv1.Open())
{
    dc.DrawLine(new Pen(Brushes.Blue), new Point(...), new Point(...));
}

// Add dv1 to the child collection of cv1
cv1.Children.Add(dv1);

// Add another arbitrary visual to cv1
cv1.Children.Add(someOtherVisual);

// Create another DrawingVisual
DrawingVisual dv2 = new DrawingVisual();

using (IDrawingContext dc = dv2.Open())
{
    // This sets up a new coordinate system
    // where everything is twice as big
    dv.PushTransform(new Scale(2.0, 2.0));

    // This line is drawn in the new scaled
    // coordinate system.
    dc.DrawLine(new Pen(Brushes.Red), new Point(...), new Point(...));

    // This reverts to the original coordinate system.
    dv.PopTransform();

    dc.DrawLine(new Pen(Brushes.Green), new Point(...), new Point(...));
}

// Add dv2 to the child collection of cv1;
cv1.Children.Add(dv2);
```

[0052] In general, a ValidationVisual 503 is conceptually similar to a DrawingVisual, except that a ValidationVisual is populated when the system requests that it be filled, instead of when the program code wants to populate it. For example, as described in U.S. Serial No. 10/185,775, the high-level composition and animation engine 214 (FIG. 2) may invalidate scene graph data as resources are needed, such as when part of a scene graph is not visible. For example if some parts are scrolled off the display, clipped, and so on. If the invalidated scene graph data is later needed, the program code 202 called will be called back to redraw (validate) the invalidated portion of the scene graph. To this end, one typical usage scenario is for a program code to subclass the ValidationVisual and override the OnValidate method. When the system calls the OnValidate method, a drawing context is passed in, and the program the uses the drawing context repopulate the ValidationVisual.

[0053] The example below shows one way to implement a simple ValidationVisual, e.g., one that draws a line with a certain color. The color of the line can be changed by calling SetColor. To force the update of the ValidationVisual, SetColor calls Invalidate to force the graphics sub-system to revalidate the ValidationVisual:

```
public class MyValidationVisual : ValidationVisual
{
    public override void OnValidate(IDrawingContext dc)
    {
        dc.DrawLine(m_color, ...);
    }

    public void SetColor(Color newColor)
    {
        m_color = color;
        Invalidate(); // Force a redraw of the ValidationVisual to
                      // reflect the color change.
    }
    private Color m_color
}
```

[0054] This example shows how to use the ValidationVisual:

```
MyValidationVisual myVV = new MyValidationVisual();

container.Children.Add(myVV);

myVV.SetColor(new Color(...));
```

[0055] FIG. 4 shows an example scene graph 400 in which ContainerVisuals and DrawingVisuals are related in a scene graph, and have associated data in the form of drawing primitives, (e.g., in corresponding drawing contexts). The ContainerVisual is a container for Visuals, and ContainerVisuals can be nested into each other. The children of a ContainerVisual can be manipulated with a VisualCollection returned from a Children property of the VisualContainer. The order of the Visuals in the VisualCollection determines in which order the Visuals are rendered, i.e. Visuals are rendered from the lowest index to the highest index from back to front (painting order). For example, with proper parameters with three drawing visuals representing red, green, and blue rectangles hierarchically under a container visual, the following code would result in three rectangles being drawn (translating to the right and down), a red rectangle in back, a green rectangle in the middle and a blue rectangle in front:

```
VisualCollection vc = m_cv.Children;
vc.Add(new DrawingVisual());
vc.Add(new DrawingVisual());
vc.Add(new DrawingVisual());

for (int i = 0; i < vc.Count; i++)
```

```
{
      DrawingVisual v = (DrawingVisual)(vc[i]);
      if (v != null)
      {
            v.Transform = Transform.CreateTranslation(i * 20.0f, i*20f);
            IDrawingContext dc = v.Open();
            dc.DrawRectangle(
                  new Brush(colors[i]),
                  null,
                  new Point2D(0, 0),
                  new Point2D(100.0f, 100.0f));
            v.Close(dc);
      }
}
```

[0056] As represented in FIG. 5, another type of visual object is a SurfaceVisual 504. In general, as represented in FIG. 3, a SurfaceVisual object 315 references an in-memory surface (bitmap) 322 that the program code 202 (FIG. 2) can access. The client program code 202 can supply its own surface memory, or it can request that the memory be allocated by the surface object.

[0057] The program code 202 has the option to open a SurfaceVisual and get a drawing context 323, into which the program code 202 can write pixel data 324 or the like and directly put those pixels onto the surface. This is represented in FIG. 3 by the dashed line between the surface object 322, the drawing context 323 (shown as a dashed box to represent its temporary nature) and the pixel data 324.

[0058] The program code 202 also has an option to create a surface visual manager 330 and associate a visual subgraph 332 with the SurfaceVisual 315. This option is represented in FIG. 3 by the dashed line between the surface object 322 and the surface visual manager 330. Note that the visual subgraph 332 can also nest other surface visuals, as also shown in FIG 3. The surface visual manager 330 (also shown as a type of other object in the set 620 of FIG. 6) walks the visual subgraph 332 to update the SurfaceVisual bitmap 322. Further, note that this traversal is scheduled by the dispatcher 308, and for efficiency may be throttled to control how often this bitmap 322 is updated. The surface visual manager 330 does not have to traverse the visual subgraph 322 each time and/or at the same rate that the top level visual manager 302 walks the rest of the scene graph.

[0059] With respect to surfaces, as further described with reference to FIGS. 9A-9C, in general, the present graphics model thus allows compositing a set of visuals to a surface, immediate-mode rendering of vector and bitmap primitives into a surface, compositing a surface onto the desktop or onto another surface, and controlling which surface in a surface list is used to composite into or to draw into. A surface list is defined as a collection of one or more surfaces (i.e. frames/buffers) of physical (system or video) memory used to store compositions of visuals or graphical drawings, or both. One of the surfaces of the surface list may be set as a current back buffer where drawing and/or compositing is done, and one of the surfaces of the surface list is set as a current primary, or front buffer, which is used to composite onto another render target.

[0060] Surfaces may be used in a number of ways. By way of example, FIG. 9A shows compositing to a surface. In FIG. 9A, a surface visual manager object 900 connects a surface list 902 as a render target for a visual tree 904. During each compositing cycle, the visuals are composited into the surface of the surface list that is currently serving as the active back buffer for the surface list. The surface being composited to can include a surface owned by the client/high level compositing engine 214 (FIG. 2) for in-process compositing scenarios, a surface owned by the low-level compositing engine 218 for scenarios where the client does not need the bits but the low-level compositing engine 218 needs them to composite the surface onto another render target, or a cross-process surface, for scenarios where the client needs access to the surface bits, but the low-level compositing engine 218 also needs the surface for other compositing work.

[0061] The compositing is controlled by a timing service that is attached to the Visual Manager. One example of a timing service, is a manual mode that might be used as in the example below:

```
// create a manual timing service and attach a visual manager
TimingService timingService = new ManualTimingService(visualManager);

// composite the visual tree to the current back buffer of the surface
visualManager.Render();

foreach (Tick tick in timingService)
```

```
{
      // advance the back buffer to the next frame of the surface
      surfaceList.NextFrame();

      // advance the time of the visual tree
      timingService.Tick(tick);

      // composite the visual tree to the current back buffer of surface
      visualManager.Render();
}
```

[0062] Another way to use a surface is with immediate-mode rendering to a surface, via a context. Attaching a surface list to a visual (a surface visual) enables immediate-mode rendering to the surface of the surface list that is currently serving as the active back buffer for the surface list. This rendering is done by obtaining a drawing context from the surface visual and executing drawing commands on that context, as described above. Note that obtaining a drawing context locks the surface so that other compositing operations cannot be done to it. Each drawing command is executed immediately, and vectors and other surfaces can be drawn (blended) onto the surface. However, other visuals cannot be drawn onto the surface, but instead can be composited into the surface by associating it with a visual manager, as previously described (e.g., in FIG. 9A).

```
// attach a surface list to a visual
SurfaceVisual surfaceVisual = new SurfaceVisual(surfaceList);

// enable immediate-mode rendering to (and lock) back buffer
surface
BaseDrawingContext dc = surfaceVisual.Open();

// draw a line (immediately) to the current back buffer of the
surface
dc.DrawLine (pen, startPoint, endPoint);
```

```
// unlock the surface - we're done with immediate-mode rendering
surfaceVisual.Close(dc);
```

[0063] Another use for surfaces is when compositing a surface onto another render target. To this end, once a surface list is attached to a surface visual, the surface can then be attached as a node in a visual tree, and the surface of the surface list that is currently serving as the primary or front buffer can be composited to another surface or to the desktop. This is illustrated in FIG. 9B and in the example below:

```
// attach a surface list to a visual
SurfaceVisual surfaceVisual = new SurfaceVisual(surfaceList);

// Add the surfaceVisual to a visual tree for compositing onto another
// render target
rootVisual.Add(surfaceVisual);
```

[0064] Live composition to/from a surface is represented in FIG. 9C, where the above-described capabilities are combined so that compositing to the back buffer surface of a surface list and compositing from the front buffer surface of a surface list (e.g. to the desktop) happen simultaneously. Note that to eliminate the undesirable video effect known as tearing, the surface list should have at least two surfaces, a front and a back buffer surface. A surface used as in FIG. 9C is likely owned by the low-level engine 218, or is a cross-process surface to make the composition in the low level engine 218 perform better.

[0065] Surfaces are constructed as independent objects, as set forth in the examples of constructors below:

```
public class Surface
{
      // create and allocate a blank surface without initial data
      public Surface(int width,
            int height,
            int dpi,
            PixelFormat pixelFormat,
            SurfaceFlags flags)

      // create a surface using the supplied memory
      public Surface(int width,
            int height,
            int dpi,
            PixelFormat pixelFormat,
            IntPtr pixels,  // managed memory for the surface
            Int stride)

      // create from a source (i.e. Clone)
      public Surface(Surface sourceSurface,
            SurfaceFlags flags)

      // Create from File or URL
      public Surface (String filename,
            SurfaceFlags flags)

      // Create from Stream
      public Surface (System.IO.Stream stream,
            SurfaceFlags flags)

      // Create from HBITMAP (which can't be selected into an HDC)
      public Surface (HBITMAP hbitmap, HPALETTE hPalette)

      // Create from HICON
      public Surface (HICON hicon)

      // read-only properties
      public Int Width {get; }

      public Int Height {get; }

      public Int Dpi {get;}

      public PixelFormat Format{get; }

      public int Stride{get; }

      public IntPtr Buffer {get;}

}
```

```
public class SurfaceList
{
      // Create a list of blank surfaces (without initial data).
      public SurfaceList (int width,
            int height,
            int dpi,
            PixelFormat pixelFormat,
            int numSurfaces,
            SurfaceFlags flags)

      // Create a SurfaceList that uses the specified surfaces
      // All the surfaces must have identical properties (w, h,
      // dpi, etc).
      public SurfaceList (Surface []surfaces)

      // change the front buffer to the first-in-line back buffer
      public Flip()

      // advance the back buffer to the next surface
      public Next()

      public int FrontBufferIndex {get; set;}

      public int BackBufferIndex {get; set;}

      public Surface GetFrontBuffer()
      public Surface GetBackBuffer()
      public Surface GetSurface(int surfaceIndex)
}
```

[0066] Once constructed, a surface and/or a surface list can be attached to a surface visual object or to a visual manager object.

```
// Create a surface visual
public SurfaceDrawingVisual(Surface surface)
public SurfaceDrawingVisual(SurfaceList surfaceList)

// Create a visual manager with a surface render target
public VisualManager(Surface surface)
public VisualManager(SurfaceList surfaceList)
```

[0067] Further, a surface can get data from a decoder, and/or send its data to an encoder for writing to a specific file format. Surfaces can also receive/send data from/to effect interfaces. A surface can be constructed for any pixel format from the full set of supported surface format types. However, some adjustments may be made to the specified pixel format, e.g., if the specified pixel format is less than 32 bits per pixel, then the format will be promoted to 32 bits per pixel. Whenever bits are requested from a surface in the original format, the surface will be copied to a buffer of the requested pixel format using a format conversion filter.

[0068] Returning to FIG. 5, yet another visual is an HwndVisual 505, which positions a Win32 child HWnd in the scene graph. More particularly, legacy programs will still operate via the WM_PAINT method (or the like) that draws to a child HWnd (or the like) based on prior graphics technology. To support such programs in the new graphics processing model, the HwndVisual allows the Hwnd to be contained in a scene graph and moved as the parent visual is repositioned, as represented in FIG. 10A. As a result of limitations with existing Hwnds, however, when rendered, a child Hwnd can only be on top of other windows, and cannot be rotated or scaled like other visuals described above. Some clipping is possible, as represented in FIG. 10B, where the dashed lines indicate the HWnd's displayed rectangle being clipped during relative movement with respect to its parent visual.

[0069] Other types of visuals 506 are also feasible, and the present object model is extensible to allow others to be developed. For example, as represented in FIG. 11, a layered visual 1100 enables an application developer to separately control the information in a visual via multiple data streams, providing a finer granularity of control relative to visuals having a single data stream. Note that similar granularity of control can be accomplished by having (e.g., three) separate child visuals under a single parent visual, however this requires that the program code work with multiple visuals, which is more complicated than working with a single layered visual having indexes to multiple layers.

[0070] By way of example, in FIG. 11, background data, content data and border data are contained in a single layered visual, but are separated from one another as indexed by a layer value, e.g., 0, 1 or 2, respectively. Layers can be inserted, including tacked onto either end, and/or deleted, with the layering order (e.g., left-to-right as shown) defining an implied Z-order for display. Note that for security, child content and other data in a layered visual cannot be enumerated.

[0071] Other types of visuals include container visuals, and redirected child HWnd visuals, in which content is drawn to a bitmap, and incorporated into a surface visual. Three-dimensional visuals enable a connection between two-dimensional and three dimensional worlds, e.g., a camera-like view is possible via a two-dimensional visual having a view into a three-dimensional world.

[0072] Many of the resource objects are immutable once created, that is, once they are created they cannot be changed for various reasons, including simplifying threading issues, preventing corruption by others, and simplifying the interaction with elements and APIs. Note that this generally simplifies the system. It should be noted, however, that it is feasible to have a system where such objects are mutable, but for example would require managing a dependency graph. For example, while it is possible to have a system where such objects are mutable, if program code changed the clip set on a Visual, the visual would need to be re-rendered, thus requiring a notification / registration mechanism, e.g., if a new clip is assigned to a visual, the visual registers itself with the clip for notifications (e.g., a clip changed notification). Thus, in one implementation, for simplification purposes, resource objects are immutable.

[0073] These resource objects can be defined with a constructor, which is a straightforward, generic way to create an object, or by using a companion builder object, as described below. For instance, to create a SolidColorBrush, (brush objects are described below), a constructor may be used:

```
Brush MyBrush = new SolidColorBrush(Colors.Red);
```

[0074] The user can also use the static members on the Brushes class to get a set of predefined colors.

[0075] Because immutable objects cannot be changed, to effectively change an object, the user needs to create a new object and replace the old one with it. To this end, many of the resource objects in the system may utilize the builder pattern, in which immutable objects are created with a builder class, which is a companion class that is mutable. The user creates an immutable object to mirror the parameters set on the builder, creates a new builder for that object, and initializes it from the immutable object. The user then changes the builder as necessary. Once done, the user can build a new object, by changing the builder and reusing it to create another immutable object. Note that having immutable objects with set properties is desirable, and that immutable objects cannot be changed, but only replaced by firing a property change event.

[0076] Thus, instead of using a constructor to create a SolidColorBrush as described above, a SolidColorBrushBuilder may be used:

```
SolidColorBrushBuilder MyBuilder = new
SolidColorBrushBuilder();
MyBuilder.Color = Colors.Red;
Brush MyBrush = MyBuilder.ToBrush();
```

[0077] Most objects that take static values can also take animation objects. For instance, on the DrawingContext there is an override on DrawCircle that takes a PointAnimationBase for the center of the circle. In this way, the user can specify rich animation information at the primitive level. For resource objects there exists an animation collection in addition to the base value. These are composited, whereby if the user wanted to animate the above example, the user could specify the following example line before the brush is built:

```
MyBuilder.ColorAnimations.Add(new ColorAnimation (...));
```

[0078] Note that an object with animation parameters is still immutable, because its animation parameters are static. However, when the scene graph is processed (e.g., traversed), the meaning of animation parameters changes over time, giving the appearance of animated, not static, data.

[0079] As described above, visuals can be drawn on by populating their drawing contexts with various drawing prim-

itives, including Geometry, ImageData and VideoData. Furthermore, there are a set of resources and classes that are shared through this entire stack. This includes Pens, Brushes, Geometry, Transforms and Effects. The IDrawingContext exposes a set of drawing operations that can be used to populate a DrawingVisual, ValidationVisual. ISurfaceDrawingContext, a base interface to IDrawing context, can be used to populate a SurfaceVisual. In other words, the drawing context exposes a set of drawing operations; for each drawing operation there are two methods, one that takes constants as arguments, and one that takes animators as arguments.

[0080] The DrawLine method draws a line with the specified pen from the start point to the end point.

```
public void DrawLine(Pen pen, Point start, Point end);
public void DrawLine(
      Pen pen,
      PointAnimationBase start,
      PointAnimationBase end);
```

[0081] The DrawRoundedRectangle method draws a rounded rectangle with the specified brush and pen; brush and pen can be null.

```
public void DrawRoundedRectangle(
      Brush brush,
      Pen pen,
      Point topLeft,
      Size size,
      float radius);
public void DrawRoundedRectangle(
      Brush brush,
      Pen pen,
      PointAnimationBase topLeft,
      SizeAnimationBase size,
      NumberAnimationBase radius);
public void DrawRoundedRectangle(
      Brush brush,
      Pen pen,
      Point topLeft,
      Point bottomRight,
      float rx,
      float ry);
public void DrawRoundedRectangle(
      Brush brush,
      Pen pen,
      PointAnimationBase topLeft,
      PointAnimationBase bottomRight,
      NumberAnimationBase radiusX,
      NumberAnimationBase radiusY);
```

[0082] The DrawGeometry method draws a path with the specified brush and pen; brush and pen can be null.

```
public void DrawGeometry(
      Brush brush,
```

```
        Pen pen,
        Geometry geometry);
```

[0083] The DrawRectangle method draws a rectangle with the specified brush and pen; brush and pen can be null.

```
    public void DrawRectangle(
        Brush brush,
        Pen pen,
        Point topLeft,
        Size size);
    public void DrawRectangle(
        Brush brush,
        Pen pen,
        PointAnimationBase topLeft,
        SizeAnimationBase size);
```

[0084] The DrawSurface method draws a surface.

```
    public void DrawSurface(
        Surface surface,
        Point topLeft,
        Size size,
        float opacity);
    public void DrawSurface(
        Surface image,
        PointAnimationBase topLeft,
        SizeAnimationBase size,
        NumberAnimationBase opacity);
```

[0085] Geometry is a type of class (FIG. 12) that defines a vector graphics skeleton, without stroke or fill. Each geometry object is a simple shape (LineGeometry, EllipseGeometry, RectangleGeometry), a complex single shape (PathGeometry) or a list of such shapes GeometryList with a combine operation (e.g., union, intersection, and so forth) specified. These objects form a class hierarchy as represented in FIG. 12.

[0086] As represented in FIG. 13, the PathGeometry is a collection of Figure objects. In turn, each of the Figure objects is composed of one or more Segment objects which actually define the figure's shape. A Figure is a sub-section of a Geometry that defines a segment collection. This segment collection is a single connected series of two-dimensional Segment objects. The Figure can be either a closed shape with a defined area, or just a connected series of Segments that define a curve, but no enclosed area.

[0087] The filled area of the PathGeometry is defined by taking the contained Figures that have their Filled property set to true, and applying a FillMode to determine the enclosed area. Note that the FillMode enumeration specifies how the intersecting areas of Figure objects contained in a Geometry are combined to form the resulting area of the Geometry. An "Alternate" rule determines whether a point is inside the canvas, by conceptually drawing a ray from that point to infinity in any direction, and then examining the places where a segment of the shape crosses the ray. By starting with a count of zero and adding one each time a Segment crosses the ray from left to right and subtracting one each time a path segment crosses the ray from right to left, after counting the crossings, if the result is zero then the point is outside the path. Otherwise, it is inside. A "winding" rule determines whether a point on the canvas is inside, and works by conceptually drawing a ray from that point to infinity in any direction and counting the number of path Segments from the given shape that the ray crosses. If this number is odd, the point is inside; if even, the point is outside.

[0088] As represented in FIG. 14, when geometry (e.g., a rectangle) is drawn, a brush or pen can be specified, as described below. Furthermore, the pen object also has a brush object. A brush object defines how to graphically fill a plane, and there is a class hierarchy of brush objects. This is represented in FIG. 14 by the filled rectangle 1402 that

results when the visual including the rectangle and brush instructions and parameters is processed.

[0089] As described below, some types of Brushes (such as gradients and nine grids) size themselves. When used, the size for these brushes is obtained from the bounding box, e.g., when the GradientUnits/DestinationUnits for the Brush is set to ObjectBoundingBox, the bounding box of the primitive that is being drawn is used. If those properties are set to UserSpaceOnUse, then the coordinate space is used.

[0090] A Pen object holds onto a Brush along with properties for Width, LineJoin, LineCap, MiterLimit, DashArray and DashOffset, as represented in the example below:

```
public enum System.Windows.Media.PenLineCap
{
    Butt, Round, Square
}
```

```
public enum System.Windows.Media.PenLineJoin
{
    Miter, Round, Bevel
}

public class System.Windows.Media.Pen
{
    // Constructors
    public Pen(Color color, float width);
    public Pen(Brush brush, float width);

    // Properties
    public float[] DashArray { get; }

    public float DashOffset { get; }
    public FloatAnimationCollection DashOffsetAnimations { get; }

    public PenLineCap LineCap { get; }
    public PenLineJoin LineJoin { get; }

    public float MiterLimit { get; }
    public FloatAnimationCollection MiterLimitAnimations { get; }

    public float Opacity { get; }
    public FloatAnimationCollection OpacityAnimations { get; }

    public Brush Brush { get; }

    public float Width { get; }
    public FloatAnimationCollection WidthAnimations { get; }
}

public sealed class System.Windows.Media.PenBuilder : Builder
{

    // Fields

    // Constructors
    public PenBuilder();
    public PenBuilder(Color color);
    public PenBuilder(Brush brush);
    public PenBuilder(Pen pen);

    // Properties
    public float[] DashArray { get; set; }

    public float DashOffset { get; set; }
    public FloatAnimationCollectionBuilder DashOffsetAnimations {
      get; }

    public PenLineCap LineCap { get; set; }
    public PenLineJoin LineJoin { get; set; }

    public float MiterLimit { get; set; }
```

```
    public FloatAnimationCollectionBuilder MiterLimitAnimations {
      get; }

    public float Opacity { get; set; }
    public FloatAnimationCollectionBuilder OpacityAnimations { get;
      }

    public Brush Brush { get; set; }

    public float Width { get; set; }
    public FloatAnimationCollectionBuilder WidthAnimations { get; }

    // Methods
    public Pen ToPen();
}
```

[0091] As mentioned above, the graphics object model of the present invention includes a Brush object model, which is generally directed towards the concept of covering a plane with pixels. Examples of types of brushes are represented in the hierarchy of FIG. 15, and, under a Brush base class, include SolidColorBrush, GradientBrush, ImageBrush, VisualBrush (which can reference a Visual) and NineGridBrush. GradientBrush includes LinearGradient and RadialGradient objects. As described above, Brush objects are immutable.

```
public abstract class System.Windows.Media.Brush
{
    float Opacity { get; }
    FloatAnimationCollection OpacityAnimations { get; }
}
```

[0092] The following sets forth an example BrushBuilder class:

```
public abstract class System.Windows.Media.BrushBuilder : Builder
{

    public virtual Brush ToBrush();
    public override sealed object CreateInstance();
    {
        return ToBrush();
    }
    float Opacity { get; set; }
    FloatAnimationCollectionBuilder OpacityAnimations { get; }
}
```

[0093] Note that Brush objects may recognize how they relate to the coordinate system when they are used, and/or how they relate to the bounding box of the shape on which they are used. In general, information such as size may be inferred from the object on which the brush is drawn. More particularly, many of the brush types use a coordinate system for specifying some of their parameters. This coordinate system can either be defined as relative to the simple bounding box of the shape to which the brush is applied, or it can be relative to the coordinate space that is active at the time that the brush is used. These are known, respectively, as ObjectBoundingBox mode and UserSpaceOnUse mode.

```
public enum System.Windows.Media.BrushMappingMode
{
    ObjectBoundingBox,
    UserSpaceOnUse,
}
```

[0094] A SolidColorBrush object fills the identified plane with a solid color. If there is an alpha component of the color, it is combined in a multiplicative way with the corresponding opacity attribute in the Brush base class. The following sets forth an example SolidColorBrush object:

```
public sealed class System.Windows.Media.SolidColorBrush : Brush
{

    // Constructors
    public SolidColorBrush(); // initialize to black
    public SolidColorBrush(Color color);
    public SolidColorBrush(System.Windows.Media.Animation.ColorComposer
      colorComposer);

    // Properties
    public Color Color { get; }
    public IEnumerator ColorAnimations { get; }
}

public class System.Windows.Media.SolidColorBrushBuilder : BrushBuilder
{
    // Constructors
    public SolidColorBrushBuilder();
    public SolidColorBrushBuilder(Color color);
    public SolidColorBrushBuilder(SolidColorBrush scp);

    // Properties
    public Color Color { get; set; }
    public AnimationList ColorAnimations { get; }

    // Methods
    public virtual Brush ToBrush();
}
```

[0095] The GradientBrush objects, or simply gradients, provide a gradient fill, and are drawn by specifying a set of gradient stops, which specify the colors along some sort of progression. The gradient is by drawn by performing linear interpolations between the gradient stops in a gamma 2.2 RGB color space; interpolation through other gammas or other color spaces (HSB, CMYK and so forth, is also a feasible alternative. Two types of gradient objects include linear and radial gradients.

[0096] In general, gradients are composed of a list of gradient stops. Each of these gradient stops contains a color (with the included alpha value) and an offset. If there are no gradient stops specified, the brush is drawn as a solid transparent black, as if there were no brush specified at all. If there is only one gradient stop specified, the brush is drawn as a solid color with the one color specified. Like other resource classes, the gradient stop class (example in the table below) is immutable.

```
public class System.Windows.Media.GradientStop
{
    public GradientStop(Color color, float offset);

    public Color Color { get; }
    public AnimationEnumerator ColorAnimations { get; }
    public float Offset { get; }
    public AnimationEnumerator OffsetAnimations { get; }
}

public class System.Windows.Media.GradientStopBuilder : Builder
{
    public GradientStopBuilder();
    public GradientStopBuilder(Color color, float offset);

    public Color Color { get; set; }
    public AnimationList ColorAnimations { get; }
    public float Offset { get; set; }
    public AnimationList OffsetAnimations { get; }
    public GradientStop ToGradientStop();
}
```

[0097] There is also a collection class, as set forth in the following example:

```
public class System.Windows.Media.GradientStopCollection : ICollection
{
    public GradientStopCollection(); // empty list
    public GradientStopCollection(GradientStop[] GradientStops);
    public GradientStopCollection(ICollection c);

    // IEnumerable
    public IEnumerator GetEnumerator();

    // ICollection
    public void CopyTo(Array array, int index);
    public bool ICollection.IsSynchronized { get { return false; } }
```

```
    public int Count { get; }
    public object ICollection.SyncRoot { get; }

    // Extra functions
    public GradientStop this[int index] { get; }
    public bool Contains(GradientStop value);
    public int IndexOf(GradientStop value); // returns first one
    public int IndexOf(GradientStop value, int startIndex);
    public int IndexOf(GradientStop value, int startIndex, int count);
    public int LastIndexOf(GradientStop value);
    public int LastIndexOf(GradientStop value, int startIndex);
    public int LastIndexOf(GradientStop value, int startIndex, int count);
    public GradientStopCollection GetRange(int index, int count);
}

public class System.Windows.Media.GradientStopCollectionBuilder : Builder,
      IList
{
    public GradientStopCollectionBuilder();
    public GradientStopCollectionBuilder(GradientStop [] GradientStops);
    public GradientStopCollectionBuilder(ICollection c);
    public GradientStopCollectionBuilder(GradientStopCollection
      GradientStops);

    // IEnumerable
    public IEnumerator GetEnumerator();

    // ICollection
    public void CopyTo(Array array, int index);
    public bool ICollection.IsSynchronized { get { return false; } }
    public int Count { get; }
    public object ICollection.SyncRoot { get; }

    // IList
    public bool IsFixedSize { get { return false; } }
    public bool IsReadOnly { get { return false; } }
    public object IList.this [int index] { get; set; }
    public int IList.Add(object value);
    public void Clear();
    public bool IList.Contains(object value);
    public int IList.IndexOf(object value); // returns first one
    public void IList.Insert(int index, object value);
    public void IList.Remove(object value); // removes first one
    public void RemoveAt(int index);

    // Extra functions
    public GradientStop this [int index] { get; set; }
    public int Add(GradientStop value);
    public bool Contains(GradientStop value);
    public int IndexOf(GradientStop value); // returns first one
    public int IndexOf(GradientStop value, int startIndex);
    public int IndexOf(GradientStop value, int startIndex, int count);
    public int LastIndexOf(GradientStop value);
    public int LastIndexOf(GradientStop value, int startIndex);
    public int LastIndexOf(GradientStop value, int startIndex, int count);
    public void Insert(int index, GradientStop value);
    public void Remove(GradientStop value); // removes first one
    public void AddRange(ICollection c);
```

```
    public void InsertRange(int index, ICollection c);
    public void RemoveRange(int index, int count);
    public void SetRange(int index, ICollection c);
    public GradientStopCollectionBuilder GetRange(int index, int count);

    // Capacity is a hint.  It will throw an exception if it is set less
      than Count.
    public int Capacity { get; set; }

    // Builder overloads
    public override object Build();
    public override void ResetBuilder();
    public override void SetBuilder(Object example);

    public GradientStopCollection ToGradientStopCollection();
}
```

[0098] As represented in the table below, the GradientSpreadMethod specifies how the gradient should be drawn outside of the specified vector or space. There are three values, including pad, in which the edge colors (first and last) are used to fill the remaining space, reflect, in which the stops are replayed in reverse order repeatedly to fill the space, and repeat, in which the stops are repeated in order until the space is filled:

```
public enum System.Windows.Media.GradientSpreadMethod
{
    Pad,
    Reflect,
    Repeat
}
```

[0099] FIG. 16 shows examples of the GradientSpreadMethod. Each shape has a linear gradient going from white to grey. The solid line represents the gradient vector.

[0100] The LinearGradient specifies a linear gradient brush along a vector. The individual stops specify colors stops along that vector. An example is shown in the table below:

```
public class System.Windows.Media.LinearGradient : GradientBrush
{
    // Sets up a gradient with two colors and a gradient vector
    // specified to fill the object the gradient is applied to.
    // This implies ObjectBoundingBox for the GradientUnits
    // property
    public LinearGradient(Color color1, Color color2, float
      angle);

    public BrushMappingMode GradientUnits { get; }
    public Transform GradientTransform { get; }
    public GradientSpreadMethod SpreadMethod { get; }

    // Gradient Vector
    public Point VectorStart { get; }
    public PointAnimationCollection VectorStartAnimations { get; }
    public Point VectorEnd { get; }
    public PointAnimationCollection VectorEndAnimations { get; }

    // Gradient Stops
    public GradientStopCollection GradientStops { get; }
}


public class System.Window.Media.LinearGradientBuilder :
     GradientBrushBuilder
{
    public LinearGradientBuilder();
    public LinearGradientBuilder(Color color1, Color color2, float
      angle);
    public LinearGradientBuilder(LinearGradient lg);

    // GradientUnits: Default is ObjectBoundingBox
    public BrushMappingMode GradientUnits { get; set; }
    // GradientTransform: Default is identity
    public Transform GradientTransform { get; set; }
    // SpreadMethod: Default is Pad
    public GradientSpreadMethod SpreadMethod { get; set; }

    // Gradient Vector
    // Default vector is (0,0) - (1,0)
    public Point VectorStart { get; set; }
    public PointAnimationCollectionBuilder VectorStartAnimations {
      get; set; }
    public Point VectorEnd { get; set; }
    public PointAnimationCollectionBuilder VectorEndAnimations { get; set;
      }
```

```
      // Gradient Stops
      public void AddStop(Color color, float offset);
      public GradientStopCollectionBuilder GradientStops { get;
set; }
```

```
}
```

[0101] The RadialGradient is similar in programming model to the linear gradient. However, whereas the linear gradient has a start and end point to define the gradient vector, the radial gradient has a circle along with a focal point to define the gradient behavior. The circle defines the end point of the gradient, that is, a gradient stop at 1.0 defines the color at the circle. The focal point defines center of the gradient. A gradient stop at 0.0 defines the color at the focal point.

[0102] FIG. 17 shows a radial gradient that from white to grey. The outside circle represents the gradient circle while the dot denotes the focal point. This example gradient has its SpreadMethod set to Pad:

```
public class System.Windows.Media.RadialGradient : GradientBrush
{
    // Sets up a gradient with two colors.
    // This implies ObjectBoundingBox for the GradientUnits
    // property along with a center at (0.5,0.5)
    // a radius of 0.5 and a focal point at (0.5,0.5)
    public RadialGradient(Color color1, Color color2);

    public BrushMappingMode GradientUnits { get; }
    public Transform GradientTransform { get; }
    public GradientSpreadMethod SpreadMethod { get; }

    // Gradient definition
    public Point CircleCenter { get; }
    public PointAnimationCollection CircleCenterAnimations { get; }
    public float CircleRadius { get; }
    public FloatAnimationCollection CircleRadiusAnimations { get; }
    public Point Focus { get; }
    public PointAnimationCollection FocusAnimations { get; }

    // Gradient Stops
    public GradientStopCollection GradientStops { get; }
}
```

```
public class System.Windows.Media.RadialGradientBuilder :
      GradientBrushBuilder
{
    public RadialGradientBuilder();
    public RadialGradient(Color color1, Color color2);
    public RadialGradientBuilder(RadialGradient rg);

    // GradientUnits: Default is ObjectBoundingBox
    public BrushMappingMode GradientUnits { get; set; }
    // GradientTransform: Default is identity
    public Transform GradientTransform { get; set; }
    // SpreadMethod: Default is Pad
    public GradientSpreadMethod SpreadMethod { get; set; }

    // Gradient definition
    public Point CircleCenter { get; set;}//Default: (0.5, 0.5)
    public PointAnimationCollectionBuilder CircleCenterAnimations { get;
      set;}
    public float CircleRadius { get;set; } // Default: 0.5
    public FloatAnimationCollectionBuilder CircleRadiusAnimations {
      get;set; }
    public Point Focus { get;set; } // Default: (0.5, 0.5)
    public PointAnimationCollectionBuilder FocusAnimations { get;set; }

    // Gradient Stops
    public void AddStop(Color color, float offset);
    public GradientStopCollectionBuilder GradientStops { get; set; }
}
```

[0103] Another brush object represented in FIG. 15 is a VisualBrush object. Conceptually, the VisualBrush provides a way to have a visual drawn in a repeated, tiled fashion as a fill. Visual paint objects also provide a mechanism for markup language to directly work with the API layer at a resource level, as described below. An example of such a fill is represented in FIG. 14 by the visual brush referencing a visual (and any child visuals) that specifies a single circular shape 1420, with that circular shape filling a rectangle 1422. Thus, the VisualBrush object may reference a visual to define how that brush is to be drawn, which introduces a type of multiple use for visuals. In this manner, a program may use an arbitrary graphics "metafile" to fill an area via a brush or pen. Since this is a compressed form for storing and using arbitrary graphics, it serves a graphics resource. The following sets forth an example VisualBrush object:

```
public class System.Windows.Media.VisualBrush : Brush
{
    public VisualBrush(Visual v);

    public BrushMappingMode DestinationUnits { get; }
    public BrushMappingMode ContentUnits { get; }
    public Transform Transform { get; }

    public Rect ViewBox { get; }
    public Stretch Stretch { get; }
    public HorizontalAlign HorizontalAlign { get; }
    public VerticalAlign VerticalAlign { get; }

    public Point Origin { get; }
    public PointAnimationCollection OriginAnimations { get; }
    public Size Size { get; }
    public SizeAnimationCollection SizeAnimations { get; }

    // Visual
    public Visual Visual { get; }
}

public class System.Windows.Media.VisualBrushBuilder : BrushBuilder
{
    public VisualBrushBuilder();
    public VisualBrushBuilder(Visual v);
    public VisualBrushBuilder(VisualBrush vb);

    // DestinationUnits: Default is ObjectBoundingBox
    public BrushMappingMode DestinationUnits { get; set; }
    // ContentUnits: Default is ObjectBoundingBox
    public BrushMappingMode ContentUnits { get; set; }
    // Transform: Default is Identity
    public Transform Transform { get; set; }
    // ViewBox: Default is (0,0,0,0) -- unset and ignored
    public Rect ViewBox { get; set; }
    // Stretch: Default is None -- and ignored
    //          because the ViewBox is not set
    public Stretch Stretch { get; set; }
    // HorizontalAlign: Default is Center and ignored
    public HorizontalAlign HorizontalAlign { get; set; }
    // VerticalAlign: Default is Center and ignored
    public VerticalAlign VerticalAlign { get; set; }

    // Origin: Default is (0,0)
    public Point Origin { get; set; }
    public PointAnimationCollectionBuilder OriginAnimations { get; set; }
    // Size: Default is (1,1)
    public Size Size { get; set; }
    public SizeAnimationCollectionBuilder SizeAnimations { get; set; }

    // Visual: Default is null -- nothing drawn
    public Visual Visual { get; set; }
}
```

[0104] A VisualBrush's contents have no intrinsic bounds, and effectively describe an infinite plane. These contents exist in their own coordinate space, and the space which is being filled by the VisualBrush is the local coordinate space at the time of application. The content space is mapped into the local space based on the ViewBox, ViewPort, Alignments and Stretch properties. The ViewBox is specified in content space, and this rectangle is mapped into the ViewPort (as specified via the Origin and Size properties) rectangle.

[0105] The ViewPort defines the location where the contents will eventually be drawn, creating the base tile for this Brush. If the value of DestinationUnits is UserSpaceOnUse, the Origin and Size properties are considered to be in local space at the time of application. If instead the value of DestinationUnits is ObjectBoundingBox, then an Origin and Size are considered to be in the coordinate space, where 0,0 is the top/left corner of the bounding box of the object being brushed, and 1,1 is the bottom/right corner of the same box. For example, consider a RectangleGeometry being filled which is drawn from 100,100 to 200,200. In such an example, if the DestinationUnits is UserSpaceOnUse, an Origin of 100,100 and a Size of 100,100 would describe the entire content area. If the DestinationUnits is ObjectBoundingBox, an Origin of 0,0 and a Size of 1,1 would describe the entire content area. If the Size is empty, this Brush renders nothing.

[0106] The ViewBox is specified in content space. This rectangle is transformed to fit within the ViewPort as determined by the Alignment properties and the Stretch property. If the Stretch is none, then no scaling is applied to the contents. If the Stretch is Fill, then the ViewBox is scaled independently in both X and Y to be the same size as the ViewPort. If the Stretch is Uniform or UniformToFill, the logic is similar but the X and Y dimensions are scaled uniformly, preserving the aspect ratio of the contents. If the Stretch is Uniform, the ViewBox is scaled to have the more constrained dimension equal to the ViewPort's size. If the Stretch is UniformToFill, the ViewBox is scaled to have the less constrained dimension equal to the ViewPort's size. In other words, both Uniform and UniformToFill preserve aspect ratio, but Uniform ensures that the entire ViewBox is within the ViewPort (potentially leaving portions of the ViewPort uncovered by the ViewBox), and UniformToFill ensures that the entire ViewPort is filled by the ViewBox (potentially causing portions of the ViewBox to be outside the ViewPort). If the ViewBox is empty, then no Stretch will apply. Note that alignment will still occur, and it will position the "point" ViewBox.

[0107] FIG. 18 provides representations of a single tile 1800 of graphics rendered with various stretch settings, including a tile 800 when stretch is set to "none." The tile 1802 is a representation of when the stretch is set to "Uniform," the tile 1804 when stretch is set to "UniformToFill," and the tile 1806 when stretch is set to "Fill."

[0108] Once the ViewPort is determined (based on DestinationUnits) and the ViewBox's size is determined (based on Stretch), the ViewBox needs to be positioned within the ViewPort. If the ViewBox is the same size as the ViewPort (if Stretch is Fill, or if it just happens to occur with one of the other three Stretch values), then the ViewBox is positioned at the Origin so as to be identical to the ViewPort. Otherwise, HorizontalAlignment and VerticalAlignment are considered. Based on these properties, the ViewBox is aligned in both X and Y dimensions. If the HorizontalAlignment is Left, then the left edge of the ViewBox will be positioned at the Left edge of the ViewPort. If it is Center, then the center of the ViewBox will be positioned at the center of the ViewPort, and if Right, then the right edges will meet. The process is repeated for the Y dimension.

[0109] If the ViewBox is (0,0,0,0), it is considered unset, whereby ContentUnits are considered. If the ContentUnits are UserSpaceOnUse, no scaling or offset occurs, and the contents are drawn into the ViewPort with no transform. If the ContentUnits are ObjectBoundingBox, then the content origin is aligned with the ViewPort Origin, and the contents are scale by the object's bounding box's width and height.

[0110] When filling a space with a VisualBrush, the contents are mapped into the ViewPort as above, and clipped to the ViewPort. This forms the base tile for the fill, and the remainder of the space is filled based on the Brush's TileMode. Finally, if set, the Brush's transform is applied - it occurs after all the other mapping, scaling, offsetting, etc.

[0111] The TileMode enumeration is used to describe if and how a space is filled by its Brush. A Brush which can be tiled has a tile rectangle defined, and this tile has a base location within the space being filled. The rest of the space is filled based on the TileMode value. FIG. 19 provides a representation of example graphics with various TileMode settings, including "None" 1900, "Tile" 1092, "FlipX" 1904, "FlipY" 1906 and "FlipXY" 1908. The top left-most tile in the various example graphics comprises the base tile.

[0112] FIG. 20 represents a process for generating the pixels for this brush. Note that the logic described in FIG. 20 is only one possible way to implement of the logic, and it should be understood that other ways, including more efficient ways, are feasible. For example, there are likely more efficient ways processing the data, e.g., such that the content is not drawn for each repetition, with the tile drawn and cached. However, FIG. 20 provides a straightforward description.

[0113] In general, each time the contents of the pattern are drawn, a new coordinate system is created. The origin and offset of each repetition is specified by the Origin and Size properties, as filtered through the DestinationUnits and Transform properties.

[0114] A coordinate frame is set up based on the DestinationUnits property. To this end, if at step 2000, the DestinationUnits property is UserSpaceOnUse, the current coordinate frame at the time the brush was used is the starting coordinate frame, via step 2002. If instead at step 2004 the property is ObjectBoundingBox, the bounding box of the geometry to which this brush is applied is used, as represented by step 2004, to set a new coordinate frame such that the upper left corner of the bounding box maps to (0,0) and the lower left corner of the bounding box maps to (1,1). In either case, at step 2006 the Transform property is applied to this coordinate frame, which essentially defines a grid.

[0115] FIG. 21 represents a VisualBrush Grid that is defined for the tiles in a VisualBrush. The first circle is a simple grid, and the second has a Transform with a Skew in the x direction of 47.

[0116] At step 2008, the visual is drawn into each cell of the grid, as represented in FIG. 22, where the visual draws the appropriate data. If at step 2010 there is a ViewBox specified, the Visual is fitted into the grid cell as specified by the ViewBox, Stretch, HorizontalAlign and VerticalAlign attributes, via step 2012. The DestinationUnits and Transform properties are used to apply the correct transform such that the visual lines up in the grid box.

[0117] If there is no ViewBox specified, then a new coordinate system is established for drawing the content at step 2014.

[0118] The coordinate frame is set such that its origin is at the Origin point for that particular grid cell being drawn.

[0119] A clip is applied at step 2018 based on the Size property such that this tile will not draw outside of the bounds of the cell. The Origin and Size are modified appropriately based on the DestinationUnits property.

[0120] The coordinate system is then modified, based on the SourceUnits property. To this end, if at step 2020 the SourceUnits property is ObjectBoundingBox, the appropriate scaling transform is applied at step 2026, otherwise it is UserSpaceOnUse, and no new transform is applied. The Transform property is applied at step 2024, and the content is drawn at step 2026.

[0121] Note that if any part of size is zero, nothing is drawn, and if Stretch is "None," the transform for the viewbox is set up such that one unit in the new coordinate frame is equal to one unit in the old coordinate frame. The transform essentially becomes an offset based on the align attributes and the size of the ViewBox. As described above at steps 2010 and 2012, Stretch and the alignment properties only apply when there is a ViewBox specified. The ViewBox specifies a new coordinate system for the contents, and Stretch helps to specify how those contents map into the ViewBox. The alignment options align the ViewBox, not the contents. Thus, for example, if the viewbox is set to "0 0 10 10" and something is drawn at -10,-10 and aligned to the upper left corner, that thing will be clipped out.

[0122] Returning to FIG. 15, image brush can be thought of as a special case of VisualBrush. Although a program can create a visual, put an image into it and attach it to VisualBrush, the API for doing so would be cumbersome. Since there is no necessary content coordinate frame, the ViewBox and ContentUnits property members no longer apply.

```
public class System.Windows.Media.ImageBrush : Brush
{
    public ImageBrush(ImageData image);

    public BrushMappingMode DestinationUnits { get; }
    public Transform Transform { get; }

    public Stretch Stretch { get; }
    public HorizontalAlign HorizontalAlign { get; }
    public VerticalAlign VerticalAlign { get; }

    public Point Origin { get; }
    public PointAnimationCollection OriginAnimations { get; }
    public Size Size { get; }
    public SizeAnimationCollection SizeAnimations { get; }

    public ImageData ImageData { get; }
}

public class System.Windows.Media.ImageBrushBuilder : BrushBuilder
{
    public ImageBrushBuilder();
    public ImageBrushBuilder(ImageData image);
    public ImageBrushBuilder(ImageBrush ib);
```

```
    // DestinationUnits: Default is ObjectBoundingBox
    public BrushMappingMode DestinationUnits { get; set; }
    // Transform: Default is identity
    public Transform Transform { get; set; }

    // Stretch: Default is None
    public Stretch Stretch { get; set; }
    // HorizontalAlign: Default is Center
    public HorizontalAlign HorizontalAlign { get; set; }
    // VerticalAlign: Default is Center
    public VerticalAlign VerticalAlign { get; set; }

    // Origin: Default is (0,0)
    public Point Origin { get; set; }
    public PointAnimationCollectionBuilder OriginAnimations { get; set; }

    // Size: Default is (1,1)
    public Size Size { get; set; }
    public SizeAnimationCollectionBuilder SizeAnimations { get; set; }

    // ImageData: Default is null -- nothing drawn
    public ImageData ImageData { get; set; }
}
```

[0123] NineGridBrush is very similar to ImageBrush except the image is warped based on the size. In essence, NineGridBrush may be thought of a custom type of Stretch, in which certain parts of the image stretch, while others (e.g., borders) do not. Thus, while the Size of the image in the ImageBrush will cause a simple scale, the NineGridBrush will produce a non-uniform scale up to the desired size. The units for the non-scaled areas are the user units when the brush is applied, which means that ContentUnits (if it existed for NineGridBrush) would be set to UserUnitsOnUse. The Transform property of the Brush can be used effectively. Note that the border members count in from the edge of the image.

[0124] By way of example, FIG. 23 represents a nine-grid image being enlarged from a first instance 2302 to a second instance 2304, with four types of areas. As represented in FIG. 23, to keep the border the same, the areas marked "a" expand horizontally, the areas marked "b" expand vertically, the areas marked "c" expand horizontally and vertically, and the areas marked "d" do not change in size.

```
public class System.Windows.Media.NineGridBrush : Brush
{
    public NineGridBrush(ImageData image,
            int LeftBorder, int RightBorder,
            int TopBorder, int BottomBorder);

    public BrushMappingMode DestinationUnits { get; }
    public Transform Transform { get; }

    public Point Origin { get; }
    public PointAnimationCollection OriginAnimations { get; }
    public Size Size { get; }
    public SizeAnimationCollection SizeAnimations { get; }

    public int LeftBorder { get; }
    public int RightBorder { get; }
    public int TopBorder { get; }
    public int BottomBorder { get; }

    public ImageData ImageData { get; }
}

public class System.Window.Media.NineGridBrushBuilder : BrushBuilder
{
    public NineGridBrushBuilder();
    public NineGridBrushBuilder (ImageData image,
            int LeftBorder, int RightBorder,
            int TopBorder, int BottomBorder);
    public NineGridBrushBuilder (NineGridBrush ngb);

    // DestinationUnits: Default is ObjectBoundingBox
    public BrushMappingMode DestinationUnits { get; set; }
    // Transform: Default is identity
    public Transform Transform { get; set; }

    // Origin: Default is (0,0)
    public Point Origin { get; set; }
    public PointAnimationCollectionBuilder OriginAnimations { get;
      set; }

    // Size: Default is (1,1)
    public Size Size { get; set; }
    public SizeAnimationCollectionBuilder SizeAnimations { get; set; }

    // *Border: default to 0
```

```
    public int LeftBorder { get; set; }
    public int RightBorder { get; set; }
    public int TopBorder { get; set; }
    public int BottomBorder { get; set; }

    // ImageData: Default is null -- nothing drawn
    public ImageData ImageData { get; set; }
}
```

[0125] As generally described above, the graphics object model of the present invention includes a Transform object

model, which includes the types of transforms represented in the hierarchy of FIG. 24, under a Transform base class. These different types of components that make up a transform may include TransformList, TranslateTransform, RotateTransform, ScaleTransform, SkewTransform, and MatrixTransform. Individual properties can be animated, e.g., a program developer can animate the Angle property of a RotateTransform.

[0126] Matrices for 2D computations are represented as a 3x3 matrix. For the needed transforms, only six values are needed instead of a full 3x3 matrix. These are named and defined as follows.

$$\begin{bmatrix} m00 & m01 & 0 \\ m10 & m11 & 0 \\ m20 & m21 & 1 \end{bmatrix}$$

[0127] When a matrix is multiplied with a point, it transforms that point from the new coordinate system to the previous coordinate system:

$$\begin{bmatrix} x_{newCoordSys} & y_{newCoordSys} & 1 \end{bmatrix} \bullet \begin{bmatrix} m00 & m01 & 0 \\ m10 & m11 & 0 \\ m20 & m21 & 1 \end{bmatrix} = \begin{bmatrix} x_{oldCoordSys} & y_{oldCoordSys} & 1 \end{bmatrix}$$

[0128] Transforms can be nested to any level. Whenever a new transform is applied it is the same as post-multiplying it onto the current transform matrix:

$$\begin{bmatrix} x_{newCoordSys} & y_{newCoordSys} & 1 \end{bmatrix} \bullet \begin{bmatrix} m00_2 & m01_2 & 0 \\ m10_2 & m11_2 & 0 \\ m20_2 & m21_2 & 1 \end{bmatrix} \bullet \begin{bmatrix} m00_1 & m01_1 & 0 \\ m10_1 & m11_1 & 0 \\ m20_1 & m21_1 & 1 \end{bmatrix} = \begin{bmatrix} x_{oldCoordSys} & y_{oldCoordSys} & 1 \end{bmatrix}$$

[0129] Most places in the API do not take a Matrix directly, but instead use the Transform class, which supports animation.

```
public struct System.Windows.Media.Matrix
{
    // Construction and setting
    public Matrix(); // defaults to identity

    public Matrix(
                double m00, double m01,
                double m10, double m11,
                double m20, double m21);

    // Identity
    public static readonly Matrix Identity;
    public void SetIdentity();
    public bool IsIdentity { get; }

    public static Matrix operator *(Matrix matrix1, Matrix
     matrix2);
    public static Point operator *(Matrix matrix, Point point);

    // These function reinitialize the current matrix with
    // the specified transform matrix.
    public void SetTranslation(double dx, double dy);
    public void SetTranslation(Size offset);
    public void SetRotation(double angle); // degrees
    public void SetRotation(double angle, Point center); // degrees
    public void SetRotationRadians(double angle);
    public void SetRotationRadians(double angle, Point center);
    public void SetScaling(double sx, double sy);
```

```
    public void SetScaling(double sx, double sy, Point center);
    public void SetSkewX(double angle); // degrees
    public void SetSkewY(double angle); // degrees
    public void SetSkewXRadians(double angle);
    public void SetSkewYRadians(double angle);

    // These function post-multiply the current matrix
    // with the specified transform
    public void ApplyTranslation(double dx, double dy);
    public void ApplyTranslation(Size offApply);
    public void ApplyRotation(double angle); // degrees
    public void ApplyRotation(double angle, Point center); //
      degrees
    public void ApplyRotationRadian(double angle);
    public void ApplyRotationRadian(double angle, Point center);
    public void ApplyScaling(double sx, double sy);
    public void ApplyScaling(double sx, double sy, Point center);
    public void ApplySkewX(double angle); // degrees
    public void ApplySkewY(double angle); // degrees
    public void ApplySkewXRadians(double angle);
    public void ApplySkewYRadians(double angle);
    public void ApplyMatrix(Matrix matrix);

    // Inversion stuff
    public double Determinant { get; }
    public bool IsInvertible { get; }
    public void Invert();  // Throws ArgumentException if
      !IsInvertable
    public static Matrix Invert(Matrix matrix);

    // Individual members
    public double M00 { get; set; }
    public double M01 { get; set; }
    public double M10 { get; set; }
    public double M11 { get; set; }
    public double M20 { get; set; }
    public double M21 { get; set; }
};
```

MARKUP LANGUAGE AND OBJECT MODEL FOR VECTOR GRAPHICS

[0130] In accordance with an aspect of the present invention, a markup language and element object model are provided to enable user programs and tools to interact with the scene graph data structure 216 without requiring a specific knowledge of the details of the API layer 212 (FIG. 2). In general, a vector graphics markup language is provided, which comprises an interchange format, along with a simple markup based authoring format for expressing vector graphics via the element object model. Via this language, markup (e.g., HTML or XML-type content) may be programmed. Then, to build the scene graph, the markup is parsed and translated into the appropriate visual API layer objects that were as described above. At this higher operating level, an element tree, the property system and the presenter system are provided to handle much of the complexity, making it straightforward for scene designers to design possibly complex scenes.

[0131] In general, the vector graphics system generally provides a set of shape and other elements, integration with a general property system, a grouping and compositing system, and a two-tiered (element level and resource level) approach so that the user can program in a way that matches flexibility and performance needs. In keeping with one aspect of the present invention, the element object model for dealing with vector graphics correlates with the scene graph object model. In other words, the vector graphics system and the Visual API layer share a set of resources at the element object model level, e.g., the Brush object is used when drawing at the Visual API and it is also the type of the fill property on Shape. Thus, in addition to having elements that correlate with the scene graph objects, the markup

language shares a number of primitive resources (e.g., brushes, transforms, and so forth) with the Visual API layer. The vector graphics system also exposes and extends the animation capabilities of the Visual API layer, which is largely shared between the levels.

[0132] Further, as described below, the vector graphics system can program to different profiles, or levels, including an element level and a resource level. In the element level, each of the drawing shapes is represented as an element at the same level as the rest of the programmable elements in a page/screen. This means that the shapes interact in a full way with the presenter system, events and properties. In the resource level, the vector graphics systems operates in a pure resource format, similar to a traditional graphics metafile. The resource level is efficient, but has somewhat limited support for cascaded properties, eventing and fine-grained programmability. The scene designer thus has the ability to balance efficiency with programmability as needed.

[0133] In keeping with one aspect of the present invention, the vector graphics system at the resource level also correlates to the visual API layer, in that the resource level markup, in one implementation, is expressed as a VisualBrush. When the resource markup is parsed, a visual object is created. The visual object is set into a VisualBrush which may be used by shapes, controls and other elements at the element level.

[0134] FIG. 25 is a representation of the element class hierarchy 2500. The classes of the markup language object model of the present invention are represented via shadowed boxes, and include a shape class 2502, an image class 2504, a video class 2506 and a canvas class 2508. Elements of the shape class include rectangle 2510, polyline 2512, polygon 2514, path 2516, line 2518 and ellipse 2520. Note that in some implementations, a circle element may not be present as indicated by the dashed box 2522 in FIG. 25, however for purposes of the various examples herein, the circle element 2522 will be described. Each element may include or be associated with fill (property) data, stroke data, clipping data, transform data, filter effect data and mask data.

[0135] As described below, shapes correspond to geometry that is drawn with inherited and cascaded presentation properties. The presentation properties are used to construct the pen and the brush needed to draw the shapes. In one implementation, shapes are full presenters, like other control elements. However, in other implementations, a canvas class 2508 may be provided as a container for shapes, and shapes can only be drawn when in a canvas element. For example, to keep shapes lightweight, shapes may not be allowed to have attached presenters. Instead, the canvas has an attached presenter and draws the shapes. Canvas elements are described in more detail below.

[0136] As also described below, the image class is more specific than a shape, and for example can include border data, which may be complex. For example, a border can be specified as one color on the top, a different color on the sides, with possibly various thicknesses specified and other properties set. Position, size rotation and scale may be set for an image or similar boxed element, such as text or video. Note that the image and video elements can exist and be shown outside of a canvas element, and also inherit from BoxedElement, e.g., to get the background, borders and padding support from that element.

[0137] The video element allows video (or similar multimedia) to be played within a displayed element. In this manner, the vector graphics system provides a markup interface to the API layer that is seamlessly consistent across multimedia, including text, 2D graphics, 3D graphics, animation, video, still images and audio. This allows designers to that learn to work with one media to easily integrate other media into applications and documents. The vector graphics system also enables multimedia to be animated in the same way as other elements, again allows designers the ability to use multimedia like other elements, yet without sacrificing the core intrinsic uniqueness of each individual media type. For example, a designer can use the same naming scheme for rotating, scaling, animating, drawing, compositing and other effects across different media types, whereby designers may easily create very rich applications, as well as allowing for a very efficient rendering and compositing implementation to be built underneath.

[0138] FIG. 26 represents one implementation in which the markup code 2602 is interpreted by a parser / translator 2604. In general, the parser / translator 2604 adds elements to an element tree / property system 208 (also represented in FIG. 2) and attaches presenters to those elements. The presenter system 210 then takes the element tree 210 with the attached presenters and translates the data to objects and calls to the visual API layer 212. Note that not all elements need to be translated, only those with attached presenters.

[0139] In general, an element is an object in the element layer that participates in the property system, eventing and layout/presentation system. The parser finds tags and decides if those tags help to define an element or a resource object. In the special case of a VisualBrush, the same tags may be interpreted as elements or also interpreted as resource objects, depending on the context of where those tags appear, e.g., depending on whether appearing in complex property syntax or not.

[0140] In accordance with one aspect of the present invention, the markup language provides distinct ways to describe a resource, including a simple string format or a complex object notation. For a simple string format, the parser / translator 2604 uses a type converter 2608 for converting a string to an appropriate visual API object. By way of example, in the following line of markup, the Fill property value can be converted to a brush object, via the type converter 2608:

```
<Circle CenterX="10" CenterY="10" Radius="5" Fill="Red" />
```

As can be readily appreciated, the conversion of such an inline line of tag-based markup with simple strings of parameters is to a brush object is straightforward, and provides a simple way for a scene designer to add a shape and its attributes to a scene.

[0141] However there are times when the fill attribute is too complex to fit into a single string. In such a situation, complex property syntax, which may be inline in the markup, is used to set this property. For example, the following complex property syntax fills a circle with a gradient rather than a solid color, specifying the colors at various gradient stops (which can range from 0 to 1):

```
<Circle CenterX="10" CenterY="10" Radius="5">
  <Circle.Fill>
    <LinearGradient>
      <GradientStop Color="Red" Offset="0"/>
      <GradientStop Color="Blue" Offset="0.33"/>
      <GradientStop Color="Green" Offset="0.66"/>
      <GradientStop Color="Red" Offset="1.0"/>
    </LinearGradient>
  </Circle.Fill>
```

```
</Circle>
```

[0142] In addition to being present inline in the markup, a resource instance may be located elsewhere (e.g., in the markup or in a file, which can be local or on a remote network and appropriately downloaded), and referenced by a name, (e.g., a text name, reference or other suitable identifier). In this manner, a scene designer can reuse an element in the element tree throughout a scene, including elements described by the complex property syntax.

[0143] The parser handles markup in the complex property syntax by accessing the type converter 2608 as necessary, and also matching specified parameters to the object properties, thereby handling the complexity for the scene designer. Thus, the parser does not just set up the objects, but also sets attributes on the objects. Note that the parser actually instantiates a builder to create the objects, since objects are immutable.

[0144] Because the same rendering model is shared between the element level and the API level, many of the objects are essentially the same. This makes parsing / translation highly efficient, and also allows different types of programming languages (e.g., C#-like languages) the ability to easily convert from the markup to its own syntax, and vice-versa. Note that as represented in FIG. 26, another such programming language 2610 can add elements to the element tree 208, or can directly interface with the visual API layer 212.

[0145] As also represented in FIG. 26 and in accordance with an aspect of the present invention, the same markup 2602 may be used to program at an element level and a resource level. As described above, the element level gives the scene designer full programmability, usage of the property system that provides inheritance (e.g., style-sheet like

features), and eventing (e.g., whereby an element may have attached code to change its appearance, position and so forth in response to a user input event). However, the present invention also provides a resource-level mechanism by which scene designers can essentially shortcut the element tree and presenter system and program directly to the visual API layer. For many types of static shapes, images and the like where element-level features are not needed, this provides a more efficient and lightweight way to output the appropriate object. To this end, the parser recognizes when a fill of type "visual brush" is present, and directly calls the API layer 212 with resource level data 2612 to create the object. In other words, as represented in FIG.22, element level vector graphics get parsed into created elements, which need later translation to the objects, while resource level vector graphics get parsed and directly stored in an efficient manner.

[0146] By way of example, the following markup is directly derived from the object model for the LinearGradient object, and fills an outer circle with a VisualBrush. The contents of that VisualBrush are defined by the inner markup. Note that this syntax is commonly used for expressing various brushes, transforms and animations:

```
<Circle CenterX="10" CenterY="10" Radius="5">
  <Circle.Fill>
    <VisualBrush xmlns="...">
      <Circle CenterX="0.5" CenterY="0.5" Radius="0.25" Fill="Blue"/>
      <Circle CenterX="0.6" CenterY="0.6" Radius="0.25" Fill="Green"/>
      <Circle CenterX="0.7" CenterY="0.7" Radius="0.25" Fill="Red"/>
      <Circle CenterX="0.8" CenterY="0.8" Radius="0.25" Fill="LemonChiffon"/>
    </VisualBrush>
  </Circle.Fill>
</Circle>
```

[0147] Note that while these visual brush-filled objects are efficiently stored, the resource level data (or the objects created thereby) can be referenced by elements and part of the element tree 208, as generally represented in FIG. 26. To this end, these visual brush resources may be named (e.g., with a name, reference or other suitable identifier) and referenced like other resources described via the complex property syntax.

[0148] Turning to an explanation of the canvas, as mentioned above in one alternative implementation, shapes may be kept lightweight and thus may be required to be contained in a canvas. In this alternative implementation, when content is rendered, it is rendered onto an infinite, device-independent canvas which has an associated coordinate system. The canvas element may thus position content according to absolute coordinates. The canvas element can optionally define a viewport, which specifies clipping, a transform, a preferred aspect ratio and a way of mapping the viewport into a parent space. If there is no viewport established, the canvas element only specifies a grouping of drawing primitives and can set up a transform, opacity and other compositing attributes.

[0149] The following is a markup example for a sample canvas:

```
<Canvas Background="black" Top="100" Left="100"Height="600" Width="800">
  <Rectangle Top="600" Left="100" Width="100" Height="50" Fill="red"
Stroke="blue" StrokeWidth="10"/>
  <Line x1="100" y1="300" x2="300" y2="100" Stroke="green" StrokeWidth="5"
/>
</Canvas>
```

[0150] Note that in one implementation, when coordinates are specified without units then they are considered as "logical pixels" of 96ths of an inch, and in the above example, the line will be 200 pixels long. In addition to coordinates, other properties include width, height horizontal and vertical alignment, and ViewBox (of type rect; default is unset or (0,0,0,0), meaning no adjustment is made, and the stretch and align properties get ignored). As generally described above with reference to FIGS. 18-20, other properties include stretch, which when not specified preserves original size, or can 1) specify a fill in which the aspect ratio is not preserved and the content is scaled to fill the bounds established by the top/left/width/height, 2) specify uniform, which scales size uniformly until the image fits the bounds established by the top/left/width/height, or 3) specify UniformToFill, which scales size uniformly to fill the bounds established by top/left/width/height, and clips as necessary.

[0151] To further correlate with the lower-level object model, the transform property establishes a new coordinate

frame for the children of the element, while the clip property restricts the region to which content can be drawn on the canvas, with the default clipping path defined as the bounding box. The ZIndex property can be used to specify rendering order for nested canvas elements within a panel.

[0152] The Viewbox specifies a new coordinate system for the contents, e.g., by redefining the extent and origin of the viewport. Stretch helps to specify how those contents map into the viewport. The value of the viewBox attribute is a list of four "unitless" numbers <min-x>, <min-y>, <width> and <height>, e.g., separated by whitespace and/or a comma, and is of type Rect. The Viewbox rect specifies the rectangle in user space that maps to the bounding box. It works the same as inserting a scaleX and scaleY. The stretch property (in case the option is other than none) provides additional control for preserving the aspect ratio of the graphics. An additional transformation is applied to descendants of the given element to achieve the specified effect.

[0153] In the example above, the effective result of the rectangle in the markup sample above under each stretch rule would be:

```
None - from (100,600) to (200,650)

Fill - from (100,100) to (900,700)

Uniform - from (100,?)  to (900,?)  - the new height will be
400, and it will centered based on HorizontalAlign and
VerticalAlign.

UniformToFill - from (?,100) to (?,700)  The new width is
1200, and will again be centered based on HorizontalAlign and
VerticalAlign.
```

[0154] If there is a transform on the canvas, it is essentially applied above (e.g., in the tree) the mapping to ViewBox. Note that this mapping will stretch any of the elements in a canvas, e.g., boxes, text, and so forth, not just shapes. Further, note that if a viewbox is specified, the canvas no longer sizes to its contents, but rather has a specified size. If y-width and y-height are also specified, then the stretch/align properties are used to fit the viewbox into the specified width and height.

[0155] The elements in the object model can each have a 'Clip' attribute applied. On some elements, notably shapes, this is exposed directly as a common language runtime property, while on others (e.g., most controls) this property is set via a DynamicProperty.

[0156] In general, the clipping path restricts the region to which content can be drawn, as generally represented in FIG. 27 wherein a button is shown in an unclipped form 2702 and a form 2704 in which a clipping path is specified (where the dashed line represents the clipping path). Conceptually, any parts of the drawing that lie outside of the region bounded by the currently active clipping path are not drawn. A clipping path can be thought of as a mask wherein those pixels outside the clipping path are black with an alpha value of zero and those pixels inside the clipping path are white with an alpha value of one (with the possible exception of anti-aliasing along the edge of the silhouette).

[0157] A clipping path is defined by a Geometry object, either inline or more typically in a resource section. A clipping path is used and/or referenced using the "Clip" property on an element, as shown in the following example:

```
<def:Resources>
    <Geometry def:ID="MyClip">
        <Path Data="..." />
        <Rectangle ...  />
      </Geometry>
</def:Resources>
     <Element Clip=""%resource; MyClip"  ... />
```

[0158] Note that animating a Clip is similar to animating transforms:

```
<Element>
    <Element.Clip>
        <Circle ..../>
        <Rectangle .... >
                <FloatAnimation ... />
        </Rectangle>
    </Element.Clip>
    ... children ...
</Element>
```

[0159] A path is drawn by specifying the 'Geometry' data and the rendering properties, such as Fill, Stroke, and StrokeWidth on the Path element. An example markup for a path is specified as follows:

```
<Path Data="M 100 100 L 300 100 L 200 300 z"
Fill="red" Stroke="blue" StrokeWidth="3" />
```

[0160] The path 'Data' string is of type Geometry. A more verbose and complete way to specify a drawn path is via the complex property syntax, as described above. The markup (such as in the following example) is fed directly into the Geometry builder classes described above:

```
  <Path>
    <Path.Data>
      <CircleGeometry ... />
      <RectangleGeometry ... />
      <PathGeometry ...  />
    </Path.Data>
    <Path.Fill value="red" />
    <Path.Stroke value="blue"/>
</Path>
```

[0161] The path data string is also described, using the following notation to describe the grammar for a path data string:

```
*: 0 or more
+: 1 or more
?: 0 or 1
(): grouping
|: separates alternatives
double quotes surround literals
```

[0162] The following shows the path data string information described with this notation (note that in one implementation, FillMode may be specified here, instead of a property at the element level):

```
wvg-path:
    wsp* moveto-drawto-command-groups? wsp*

moveto-drawto-command-groups:
    moveto-drawto-command-group
    | moveto-drawto-command-group wsp* moveto-drawto-command-
groups

moveto-drawto-command-group:
    moveto wsp* drawto-commands?

drawto-commands:
    drawto-command
    | drawto-command wsp* drawto-commands

drawto-command:
    closepath
    | lineto
    | horizontal-lineto
    | vertical-lineto
    | curveto
    | smooth-curveto
    | quadratic-bezier-curveto
```

```
    | smooth-quadratic-bezier-curveto
    | elliptical-arc

moveto:
    ( "M" | "m" ) wsp* moveto-argument-sequence

moveto-argument-sequence:
    coordinate-pair
    | coordinate-pair comma-wsp? lineto-argument-sequence

closepath:
    ("Z" | "z")

lineto:
    ( "L" | "l" ) wsp* lineto-argument-sequence

lineto-argument-sequence:
    coordinate-pair
    | coordinate-pair comma-wsp? lineto-argument-sequence

horizontal-lineto:
    ( "H" | "h" ) wsp* horizontal-lineto-argument-sequence

horizontal-lineto-argument-sequence:
    coordinate
    | coordinate comma-wsp? horizontal-lineto-argument-
sequence

vertical-lineto:
    ( "V" | "v" ) wsp* vertical-lineto-argument-sequence

vertical-lineto-argument-sequence:
    coordinate
    | coordinate comma-wsp? vertical-lineto-argument-sequence

curveto:
    ( "C" | "c" ) wsp* curveto-argument-sequence

curveto-argument-sequence:
    curveto-argument
    | curveto-argument comma-wsp? curveto-argument-sequence

curveto-argument:
    coordinate-pair comma-wsp? coordinate-pair comma-wsp?
coordinate-pair

smooth-curveto:
    ( "S" | "s" ) wsp* smooth-curveto-argument-sequence

smooth-curveto-argument-sequence:
```

```
    smooth-curveto-argument
    | smooth-curveto-argument comma-wsp? smooth-curveto-
argument-sequence

smooth-curveto-argument:
    coordinate-pair comma-wsp? coordinate-pair

quadratic-bezier-curveto:
    ( "Q" | "q" ) wsp* quadratic-bezier-curveto-argument-
sequence

quadratic-bezier-curveto-argument-sequence:
    quadratic-bezier-curveto-argument
    | quadratic-bezier-curveto-argument comma-wsp?
        quadratic-bezier-curveto-argument-sequence

quadratic-bezier-curveto-argument:
    coordinate-pair comma-wsp? coordinate-pair

smooth-quadratic-bezier-curveto:
    ( "T" | "t" ) wsp* smooth-quadratic-bezier-curveto-
argument-sequence

smooth-quadratic-bezier-curveto-argument-sequence:
    coordinate-pair
    | coordinate-pair comma-wsp? smooth-quadratic-bezier-
curveto-argument-sequence

elliptical-arc:
    ( "A" | "a" ) wsp* elliptical-arc-argument-sequence

elliptical-arc-argument-sequence:
    elliptical-arc-argument
    | elliptical-arc-argument comma-wsp? elliptical-arc-
argument-sequence

elliptical-arc-argument:
    nonnegative-number comma-wsp? nonnegative-number comma-
wsp?
        number comma-wsp flag comma-wsp flag comma-wsp
coordinate-pair

coordinate-pair:
    coordinate comma-wsp? coordinate

coordinate:
    number

nonnegative-number:
    integer-constant
```

```
    | floating-point-constant

number:
    sign? integer-constant
    | sign? floating-point-constant

flag:
    "0" | "1"

comma-wsp:
    (wsp+ comma? wsp*) | (comma wsp*)

comma:
    ","

integer-constant:
    digit-sequence

floating-point-constant:
    fractional-constant exponent?
    | digit-sequence exponent

fractional-constant:
    digit-sequence? "." digit-sequence
    | digit-sequence "."

exponent:
    ( "e" | "E" ) sign? digit-sequence

sign:
    "+" | "-"

digit-sequence:
    digit
    | digit digit-sequence

digit:
    "0" | "1" | "2" | "3" | "4" | "5" | "6" | "7" | "8" | "9"

wsp:
    (#x20 | #x9 | #xD | #xA)
```

[0163] The image element (FIG. 25) indicates that the contents of a complete file are to be rendered into a given rectangle within the current user coordinate system. The image (indicated by the image tag) can refer to raster image files such as PNG or JPEG, or to files with MIME type of "image/wvg", as set forth in the following example:

```
<Image Top="200" Left="200" Width="100px" Height="100px"
Source ="myimage.png">
</Image>
```

[0164] The following table provides information on some example properties for images:

Name	Type	R/RW	Default Value	Description
Top	BoxUnit			Coordinate for the top side of the Image
Left	BoxUnit			Coordinate for the left side of the Image
Width	BoxUnit			Width of the Image
Height	BoxUnit			Height of the Image
Source	ImageData			Source of the Image
Dpi	Float		96(?)	Target DPI to use for sizing
HorizontalAlign	enum { Left (?), Center (?), Right(?) }		Center	
VerticalAlign	enum { Top (?), Middle (?), Bottom(?) }		Middle	
Stretch	enum Stretch { None, Fill, Uniform, UniformToFill }		None	**None**: Preserve original size **Fill**: Aspect ratio is not preserved and the content is scaled to fill the bounds established by tlbh **Uniform** Scale size uniformly until the image fits the bounds established by the tlwh. **UniformToFill**: Scale size uniformly to fill the bounds established by tlbh, and clipped.
ReadyState	enum { MetaDataReady, Loading, Loaded LoadError }			
LoadCounter	Int	Read	Null	Counter that increments when ReadyState is Loading
Name	String			Alternate text for the Image.

[0165] As described above, shapes correspond to geometry drawn with inherited and cascaded presentation properties. The following tables set forth example shape properties for the basic shape elements described above (Rectangle, Ellipse, Line, Polyline, Polygon). Note that these basic shapes may have stroke properties, fill properties, and used as clip paths, have inheritance characteristics, and apply to both the element and Resource levels:

Name	Type	R/RW	Default Value	Description
Fill	Brush	RW	null	Coordinate for the top side of the rect
FillOpacity	Float	RW	1.0	Coordinate for the left side of the rect
Stroke	Brush	RW	null	Width of the rect
StrokeOpacity	Float	RW	1.0	Height of the rect
StrokeWidth	BoxUnit	RW	1px	Width of the stroke. 1px = 1/96 of an inch
FillRule	enum { EvenOdd, NonZero }	RW	EvenOdd	FillRule indicates the algorithm which is to be used to determine what parts of the canvas are included inside the shape.
StrokeLineCap	enum { Butt, Round, Square, Diamond }	RW	Butt	StrokeLineCap specifies the shape to be used at the end of open subpaths when they are stroked.
StrokeLineJoi nt	enum { Miter, Round, Bevel }	RW	Miter	StrokeLineJoin specifies the shape to be used at the corners of paths (or other vector shapes) that are stroked when they are stroked.
StrokeMiterLi mit	Float	RW	4.0	The limit on the ratio of the MiterLength to the StrokeWidth. Value to be >= 1
StrokeDashArr ay	PointLis t	RW	null	StrokeDashArray controls the pattern of dashes and gaps used to stroke paths. <dasharray> contains a list of space- or comma-separated <number>s that specify the lengths of alternating dashes and gaps in user units. If an odd number of values is provided, then the list of values is repeated to yield an even number of values. Thus, stroke-dasharray: 5 3 2 is equivalent to stroke-dasharray: 5 3 2 5 3 2.
StrokeDashOff set	Point	RW		StrokeDashoffset specifies the distance into the dash pattern to start the dash.
Transform	Transfer m	RW	null	Transform establishes a new coordinate frame for the children of the element

(continued)

Name	Type	R/RW	Default Value	Description
Clip	Geometry	RW	null	Clip restricts the region to which paint can be applied on the canvas. The default clipping path is defined as the bounding box.

[0166] The following is an example markup syntax for a rectangle:

```
<Rectangle Top="600" Left="100" Width="100" Height="50"
Fill="red" Stroke="blue" StrokeWidth="10"/>
```

[0167] A rectangle has the following properties in the object model (note that rectangles are read/write, have default values equal to zero, support inheritance and apply to both the element and Resource levels):

Name	Type	Description
Top	BoxUnit	Coordinate for the top side of the rect
Left	BoxUnit	Coordinate for the left side of the rect
Width	BoxUnit	Width of the rect
Height	BoxUnit	Height of the rect
RadiusX	BoxUnit	For rounded rectangles, the X-axis radius of the ellipse used to round off the corners of the rectangle. If a negative X-axis radius is specified, the absolute value of the radius will be used.
RadiusY	BoxUnit	For rounded rectangles, the Y-axis radius of the ellipse used to round off the corners of the rectangle. If a negative X-axis radius is specified, the absolute value of the radius will be used.

[0168] The following is an example markup syntax for a circle:

```
<Circle CenterX="600" CenterY="100" Fill="red"
Stroke="blue" StrokeWidth="10"/>
```

A circle has the following properties in the object model (note that circles are read/write, have default values equal to zero, support inheritance and apply to both the element and Resource levels):

Name	Type	Description
CenterX	BoxUnit	X coordinate of the center of the circle
CenterY	BoxUnit	X coordinate of the center of the circle
Radius	BoxUnit	Radius of the circle

[0169] The following is an example markup syntax for an ellipse:

```
<Ellipse CenterX="600" CenterY="100" Fill="red"
Stroke="blue" StrokeWidth="10"/>
```

An ellipse has the following properties in the object model (note that ellipses are read/write, have default values equal to zero, support inheritance and apply to both the element and Resource levels):

Name	Type	Description
CenterX	Coordinate	X coordinate of the center of the ellipse
CenterY	Coordinate	X coordinate of the center of the ellipse
RadiusX	Length	The X-axis radius of the ellipse. If a negative X-axis radius is specified, the absolute value of the radius will be used.
RadiusY	Length	The Y-axis radius of the ellipse. If a negative Y-axis radius is specified, the absolute value of the radius will be used.

[0170] The following is an example markup syntax for a line:

```
<Line x1="100" y1="300" x2="300" y2="100"
StrokeWidth="5" />
```

A line has the following properties in the object model (note that lines are read/write, have default values equal to zero, support inheritance and apply to both the element and Resource levels):

Name	**Type**	**Description**
X1	BoxUnit	The X-axis coordinate of the start of the line. The default value is "0".
Y1	BoxUnit	The Y-axis coordinate of the start of the line. The default value is "0".
X2	BoxUnit	The X-axis coordinate of the end of the line. The default value is "0".
Y2	BoxUnit	The Y-axis coordinate of the end of the line. The default value is "0".

[0171] The 'Polyline' defines a set of connected straight line segments. Typically, a 'Polyline' defines an open shape.

[0172] The following is an example markup syntax for a polyline:

```
<Polyline Fill="None" Stroke="Blue" StrokeWidth="10cm"
Points="50,375
150,375 150,325 250,325 250,375
350,375 350,250 450,250 450,375
550,375 550,175 650,175 650,375
750,375 750,100 850,100 850,375
950,375 950,25 1050,25 1050,375
1150,375" />
```

A polyline has the following properties in the object model (note that lines are read/write, have default values equal to null, support inheritance and apply to both the element and Resource levels):

Name	Type	Description
Points	PointCollection	The points that make up the Polyline. Coordinate values are in the user coordinate system.

[0173] The Polygon element defines a closed shape comprising a set of connected straight line segments. The following is an example markup syntax for a polygon:

```
<Polygon Fill="red" Stroke="blue" StrokeWidth="10"
     points="350,75 379,161 469,161 397,215
     423,301 350,250 277,301 303,215
     231,161 321,161" />
```

A polygon has the following properties in the object model (note that lines are read/write, have default values equal to null, support inheritance and apply to both the element and Resource levels):

Name	Type	Description
Points	PointCollection	The points that make up the Polygon. Coordinate values are in the user coordinate system. If an odd number of coordinates are provided, then the element is in error.

[0174] The grammar for points specifications in 'polyline' and 'polygon' elements is described with the following notation:

```
*: 0 or more
+: 1 or more
?: 0 or 1
(): grouping
|: separates alternatives
double quotes surround literals
```

[0175] The following describes the points specifications in 'Polyline' and 'Polygon' elements using the above notation:

```
list-of-points:
    wsp* coordinate-pairs? wsp*

coordinate-pairs:
    coordinate-pair
    | coordinate-pair comma-wsp coordinate-pairs

coordinate-pair:
    coordinate comma-wsp coordinate

coordinate:
    number

number:
    sign? integer-constant
    | sign? floating-point-constant

comma-wsp:
    (wsp+ comma? wsp*) | (comma wsp*)

comma:
    ","

integer-constant:
    digit-sequence

floating-point-constant:
    fractional-constant exponent?
    | digit-sequence exponent

fractional-constant:
    digit-sequence? "." digit-sequence
```

```
    | digit-sequence "."

exponent:
    ( "e" | "E" ) sign? digit-sequence

sign:
    "+" | "-"

digit-sequence:
    digit
    | digit digit-sequence

digit:
    "0" | "1" | "2" | "3" | "4" | "5" | "6" | "7" | "8" | "9"

wsp:
    (#x20 | #x9 | #xD | #xA)+
```

CONCLUSION

[0176] As can be seen from the foregoing detailed description, there is provided a system, method and element / object model that provide program code various mechanisms to interface with a scene graph. The system, method

and object model are straightforward to use, yet powerful, flexible and extensible.

[0177] While the invention is susceptible to various modifications and alternative constructions, certain illustrated embodiments thereof are shown in the drawings and have been described above in detail. It should be understood, however, that there is no intention to limit the invention to the specific forms disclosed, but on the contrary, the intention is to cover all modifications, alternative constructions, and equivalents falling within the spirit and scope of the invention.

Claims

1. In a computing environment, a system comprising:

   a mechanism that interprets markup to construct an element tree of elements, at least some of the elements in the element tree having associated property data and corresponding to an element object model;
   a scene graph interface layer, comprising a set of at least one interface that populates a scene graph with objects in response to requests to create the objects, the objects corresponding to a scene graph object model; and
   a translator that translates at least some of the elements and property data in the element tree into requests to the scene graph interface layer to create objects in the scene graph.

2. The system of claim 1 wherein the elements of the element object model substantially correlate with the objects of the scene graph object model.

3. The system of claim 1 wherein the markup includes inline text including a string that defines an element property, and the translator communicates with a type converter to convert the string to an object property.

4. The system of claim 1 wherein the markup includes inline text comprising complex property syntax.

5. The system of claim 4 wherein the inline text is identified with a reference that is referred to at another location in the markup.

6. The system of claim 4 wherein the inline text is identified with a reference that refers to a file.

7. The system of claim 4 wherein the inline text is identified with a reference that corresponds to a file that may be downloaded from a remote location in a network.

8. The system of claim 1 wherein the markup includes inline text comprising complex property syntax corresponding to a graphical resource.

9. The system of claim 8 wherein the graphical resource describes a visual brush object, the translator providing resource level data for directly communicating with the scene graph interface layer to create a visual paint object corresponding to the element described by the complex property syntax.

10. The system of claim 9 wherein the resource level data is identified with a reference that is referred to at another location in the markup.

11. The system of claim 9 wherein the resource level data is identified with a reference that refers to a file.

12. The system of claim 9 wherein the resource level data is identified with a reference that refers to a file that may be downloaded from a remote location in a network.

13. The system of claim 1 wherein one of the elements of the element object model comprises an image element.

14. The system of claim 1 wherein one of the elements of the element object model comprises a video element.

15. The system of claim 1 wherein one of the elements of the element object model comprises a canvas element that contains a shape element.

16. The system of claim 1 wherein one of the elements of the element object model comprises a shape element.

17. The system of claim 16 wherein the shape element comprises a rectangle element.

18. The system of claim 16 wherein the shape element comprises a polyline element.

19. The system of claim 16 wherein the shape element comprises a polygon element.

20. The system of claim 16 wherein the shape element comprises a path element.

21. The system of claim 16 wherein the shape element comprises a line element.

22. The system of claim 16 wherein the shape element comprises an ellipse element.

23. The system of claim 16 wherein the shape element comprises a circle element.

24. The system of claim 16 wherein the shape element includes fill property data.

25. The system of claim 16 wherein the shape element includes stroke property data.

26. The system of claim 16 wherein the shape element includes clipping property data.

27. The system of claim 16 wherein the shape element includes transform property data.

28. The system of claim 16 wherein the shape element includes effect data.

29. The system of claim 16 wherein the shape element includes opacity data.

30. The system of claim 16 wherein the shape element includes blend mode data.

31. The system of claim 1 further comprising an engine that processes the scene graph data structure and provides commands to at least one lower level graphics component.

32. The system of claim 31 wherein the engine traverses the scene graph data structure.

33. The system of claim 31 wherein the engine transmits the scene graph data structure.

34. The system of claim 1 wherein the translator requests instantiation of at least one builder to create the objects.

35. A computer-implemented method, comprising:

parsing markup, the markup including tags and associated property data according to an object model;
interpreting a tag in the markup to determine whether the tag is directed to an element level or to a resource level;
and

a) if the tag is directed to the element level, creating an element based on the tag and property data associated with the tag and adding the element to an element tree for later translation into a scene graph object in a scene graph data structure; and
b) if the tag is directed to the resource level, providing data to directly create a scene graph object in the scene graph data structure via an interface to the scene graph data structure.

36. The method of claim 35 wherein objects of the element object model substantially correlate with objects in the scene graph data structure.

37. The method of claim 35 wherein the markup includes inline text for a tag property value and further comprising, communicating with a type converter to convert the inline text to an object property.

38. The method of claim 35 wherein the markup includes inline text for a tag property value having a reference to other text in the markup, and wherein interpreting the tag property value comprises interpreting the other text.

39. The method of claim 35 wherein the markup includes tags comprising complex property syntax for an element, and wherein interpreting the tags comprises interpreting the complex property syntax to determine that the tags are directed to the element level.

40. The method of claim 35 wherein the markup includes tags specifying complex property syntax for an element, and wherein interpreting the tags comprises interpreting the complex property syntax to determine that the element is directed to the resource level.

41. The method of claim 40 wherein interpreting the complex property syntax comprises detecting that the complex property syntax describes a property corresponding to a visual brush object.

42. The method of claim 40 wherein tags defining a visual brush object are referenced by an element in the element tree.

43. A computer-readable medium having computer-executable instructions for performing the method of claim 35.

44. A computer-readable medium having stored thereon a data structure, comprising:

a first set of data comprising a first set of tags and property data, in which the context in which the first set of tags is interpreted indicates that the first set of tags is directed to an element level;
a second set of data comprising a second set of tags and second property data, in which the context in which the second set of tags is interpreted corresponds to complex property syntax and indicates that the second set of tags is directed to a resource level; and
when the data structure is interpreted, the first set of data results in data corresponding to the first set of tags being created and inserted into an element-level tree based on the first information in the first set of text, and the second set of data results in data corresponding to the second set of tags being provided to directly create a scene graph object in a scene graph data structure at the resource level via an interface to the scene graph data structure, based on the second information in the second set of text.

45. The data structure of claim 44 further comprising a third set of data comprising a string corresponding to a property value.

46. The data structure of claim 44 wherein the first set of tags specify an identifier, and further comprising a third set of data that references the identifier.

47. The data structure of claim 46 wherein when interpreted, the third set of data results in data corresponding to the first set of tags being added to the element-level tree in a tree location for the third set of data.

48. The data structure of claim 44 wherein the second set of tags includes an identifier, and further comprising a third set of data that references the identifier.

49. The data structure of claim 44 wherein the second set of tags includes data formatted in a complex property syntax inline in markup.

50. The data structure of claim 49 wherein the complex property syntax describes a resource level element having a fill property corresponding to a visual paint object.

51. The data structure of claim 49 wherein the complex property syntax describes properties of an image element.

52. The data structure of claim 49 wherein the complex property syntax describes properties of a video element.

53. The data structure of claim 44 wherein the first set of tags describes properties of a shape element.

54. The data structure of claim 53 further comprising data in the data structure that describes a canvas element that contains the shape element.

55. The data structure of claim 53 wherein the properties of the shape element comprise fill property data.

56. The data structure of claim 53 wherein the properties of the shape element comprise stroke property data.

57. The data structure of claim 44 wherein the properties of the first element include clipping data.

58. The data structure of claim 44 wherein the properties of the first element include transform data

59. The data structure of claim 44 wherein the properties of the first element include opacity data.

60. The data structure of claim 44 wherein the properties of the first element include blend mode data.

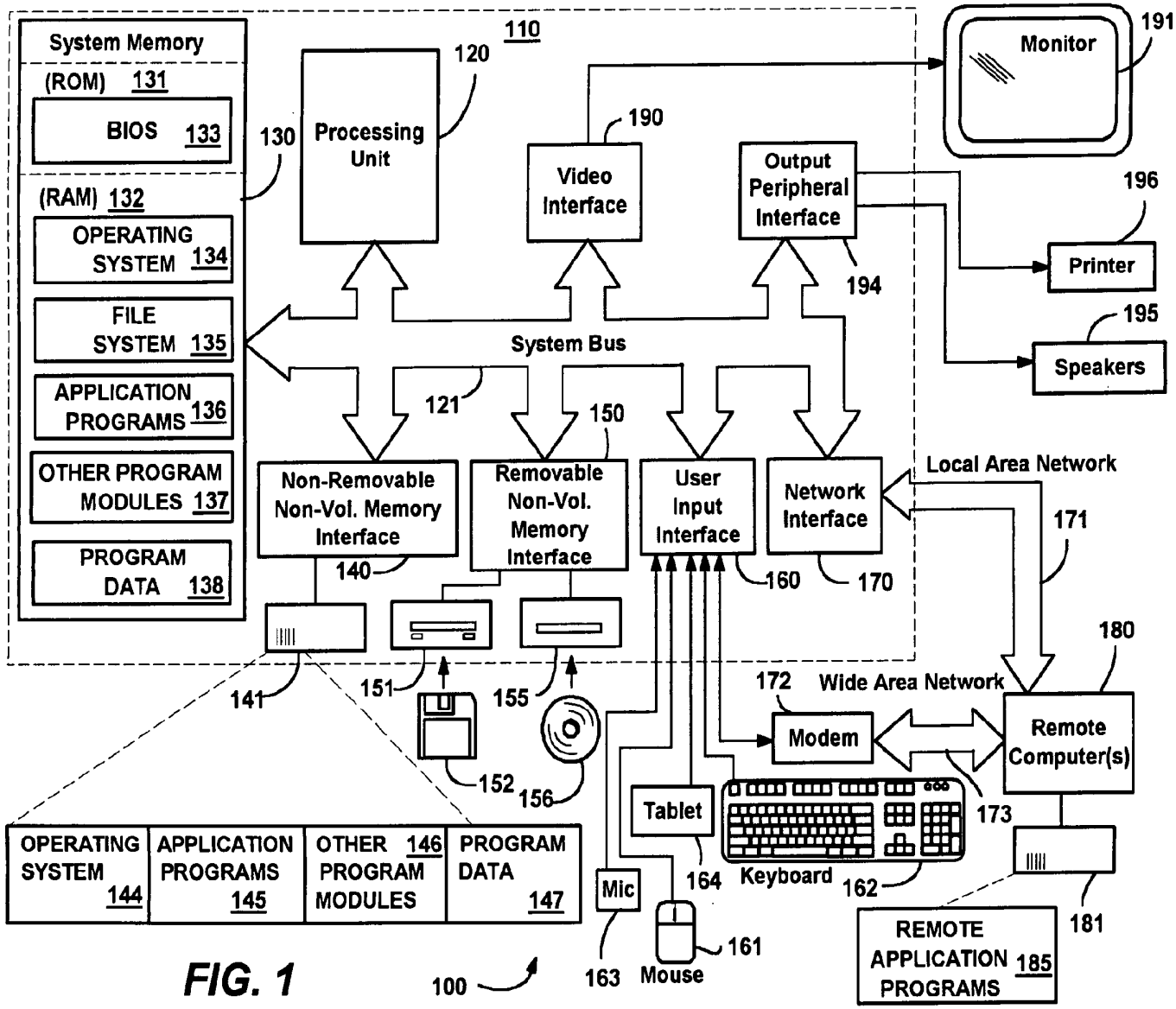

System Memory
(ROM) 131
BIOS 133
(RAM) 132
OPERATING SYSTEM 134
FILE SYSTEM 135
APPLICATION PROGRAMS 136
OTHER PROGRAM MODULES 137
PROGRAM DATA 138
110
120
130
Processing Unit
190
Video Interface
Output Peripheral Interface
194
Monitor
191
196
Printer
195
Speakers
System Bus
121
150
Non-Removable Non-Vol. Memory Interface
Removable Non-Vol. Memory Interface
User Input Interface
Network Interface
160
170
Local Area Network
171
140
141
151
155
152
156
172
Wide Area Network
Modem
180
Remote Computer(s)
173
Tablet
164
Keyboard
162
Mic
163
Mouse
161
181
REMOTE APPLICATION PROGRAMS 185
OPERATING SYSTEM 144
APPLICATION PROGRAMS 145
OTHER PROGRAM MODULES 146
PROGRAM DATA 147
100

FIG. 1

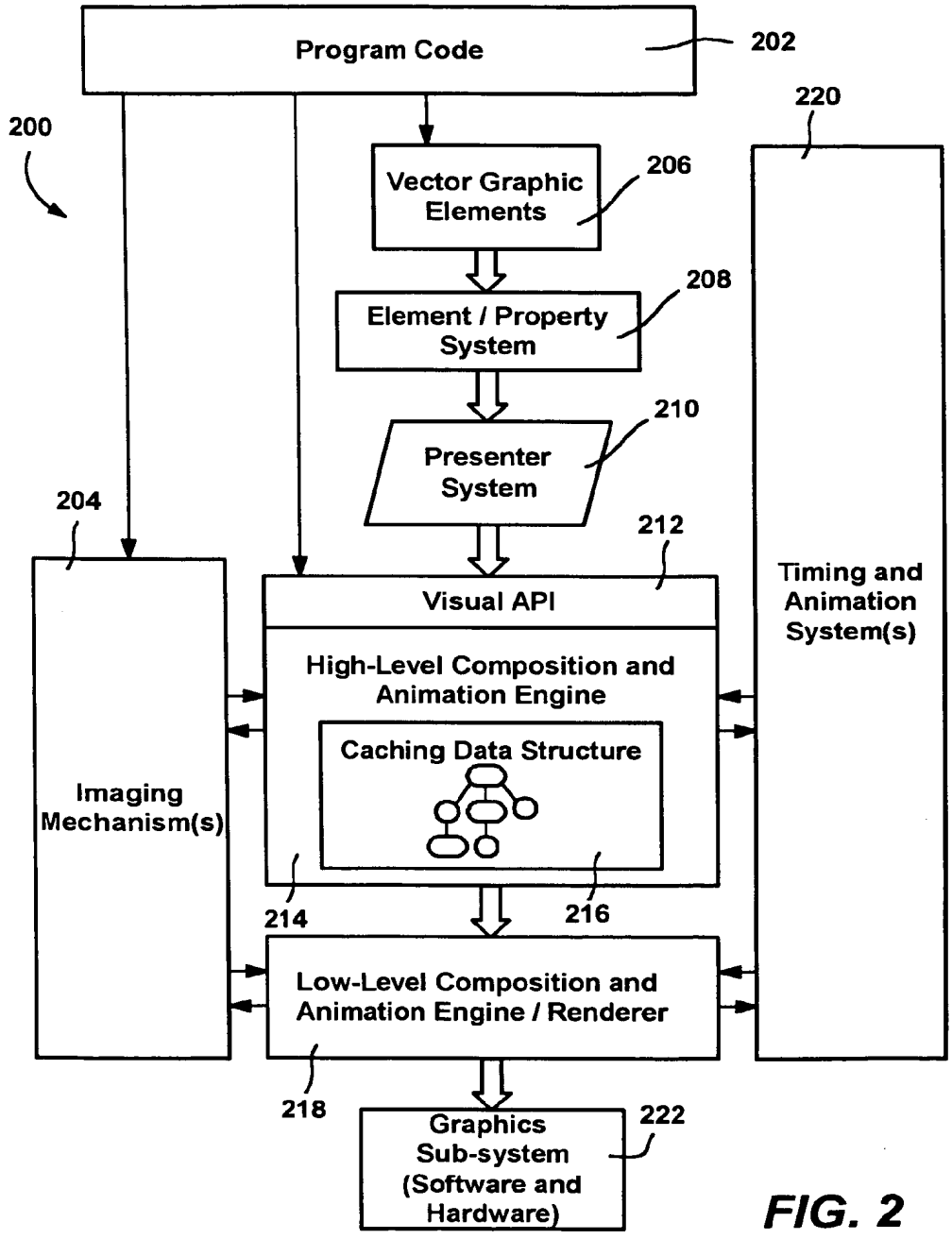

Program Code
202
200
220
Vector Graphic Elements
206
Element / Property System
208
Presenter System
210
204
212
Visual API
Timing and Animation System(s)
High-Level Composition and Animation Engine
Caching Data Structure
Imaging Mechanism(s)
214
216
Low-Level Composition and Animation Engine / Renderer
218
Graphics Sub-system (Software and Hardware)
222

FIG. 2

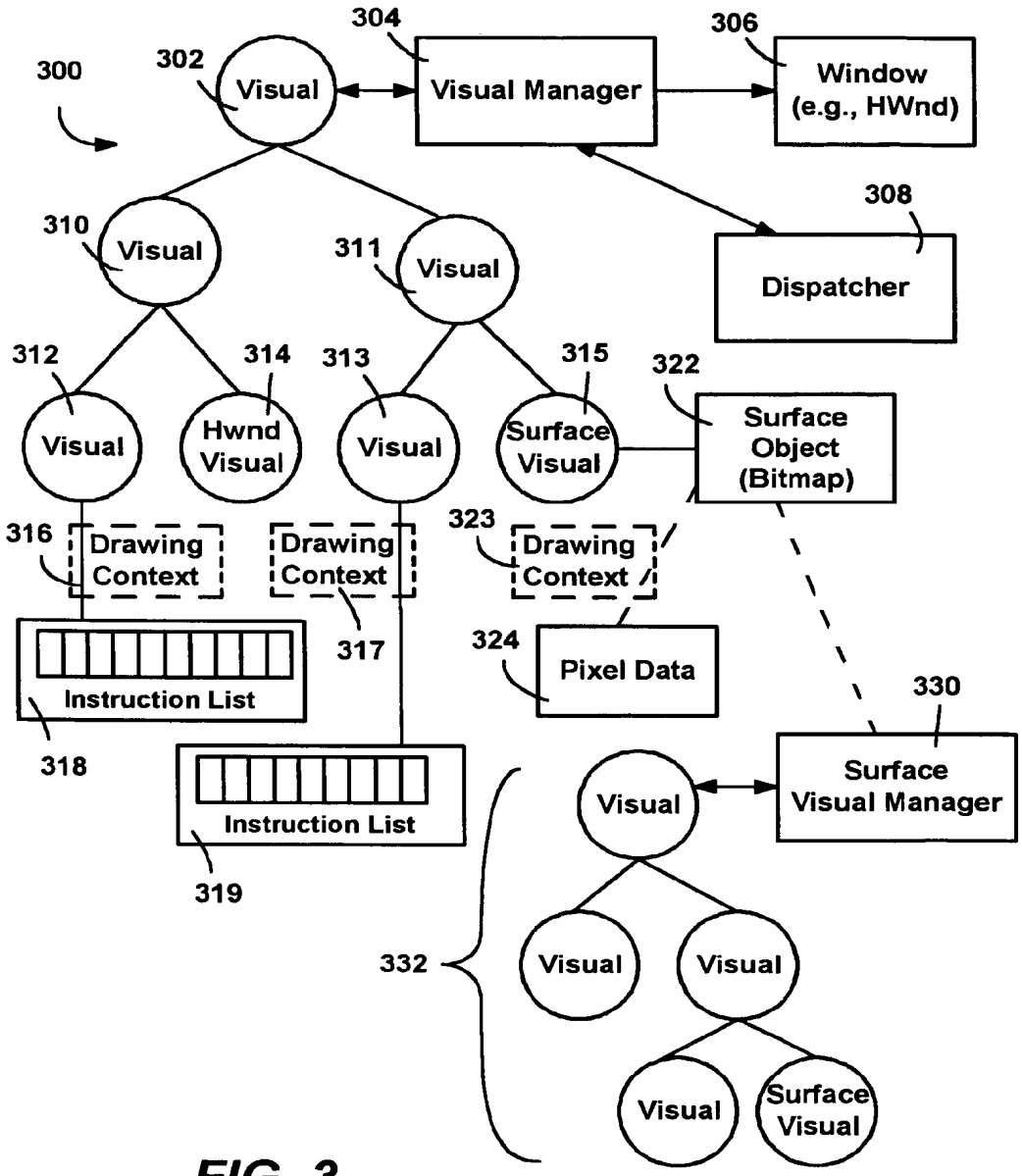

300
302
Visual
304
Visual Manager
306
Window
(e.g., HWnd)
308
Dispatcher
310
Visual
311
Visual
312
Visual
314
Hwnd
Visual
313
Visual
315
Surface
Visual
322
Surface
Object
(Bitmap)
316
Drawing
Context
Drawing
Context
317
323
Drawing
Context
324
Pixel Data
Instruction List
318
Instruction List
319
330
Surface
Visual Manager
332
Visual
Visual
Visual
Visual
Surface
Visual

FIG. 3

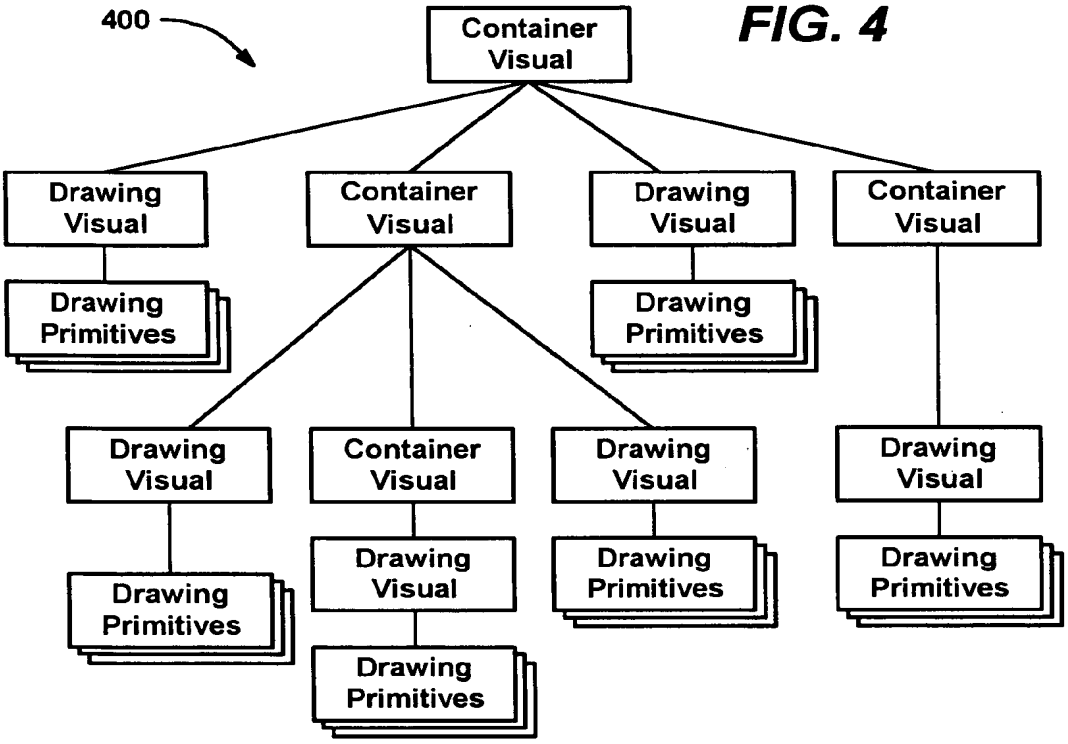

400
Container Visual
Drawing Visual
Container Visual
Drawing Visual
Container Visual
Drawing Primitives
Drawing Primitives
Drawing Visual
Container Visual
Drawing Visual
Drawing Visual
Drawing Primitives
Drawing Visual
Drawing Primitives
Drawing Primitives
Drawing Primitives

FIG. 4

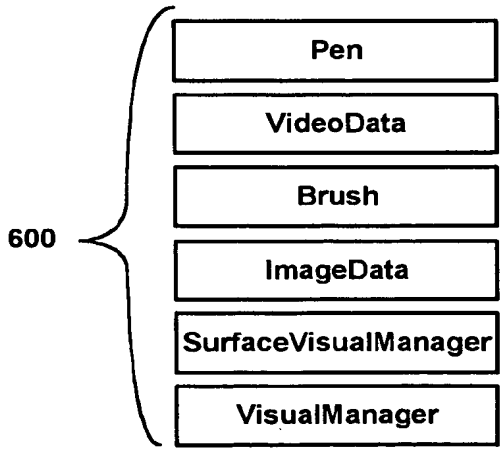

600
Pen
VideoData
Brush
ImageData
SurfaceVisualManager
VisualManager

FIG. 6

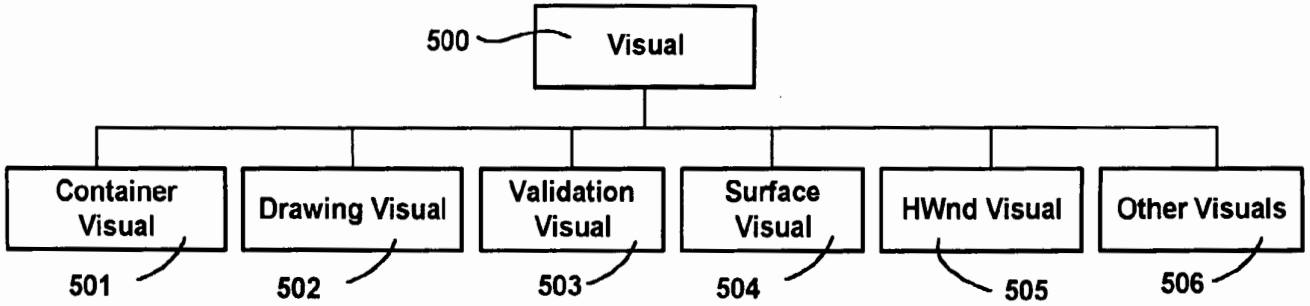

500
Visual
Container Visual
Drawing Visual
Validation Visual
Surface Visual
HWnd Visual
Other Visuals
501
502
503
504
505
506

FIG. 5

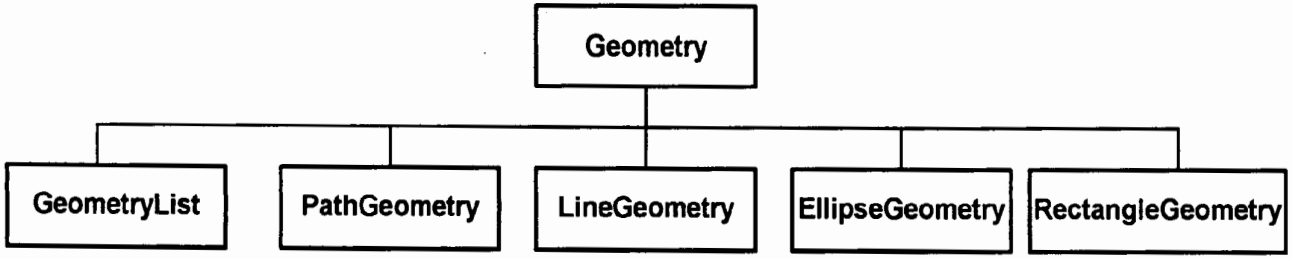

Geometry
GeometryList
PathGeometry
LineGeometry
EllipseGeometry
RectangleGeometry

FIG. 12

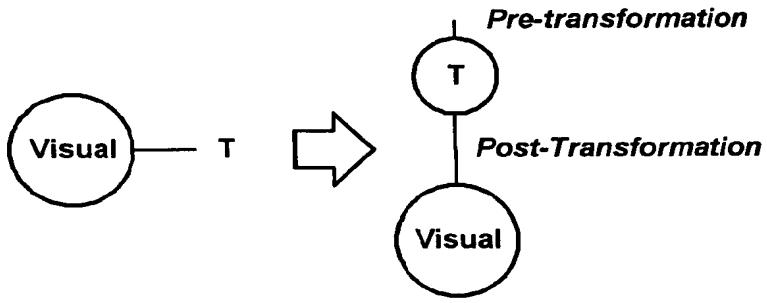

Pre-transformation
T
Visual
T
Post-Transformation
Visual

FIG. 7

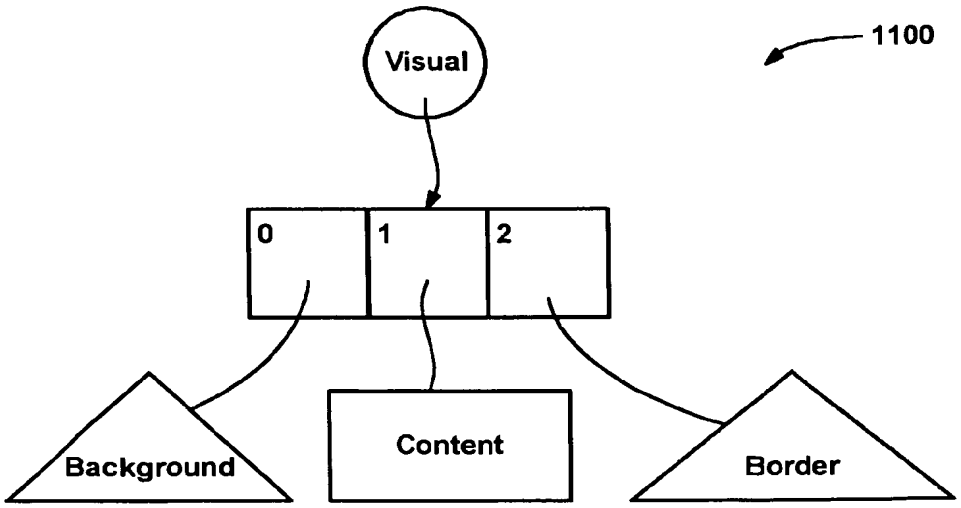

Visual
1100
0
1
2
Background
Content
Border

FIG. 11

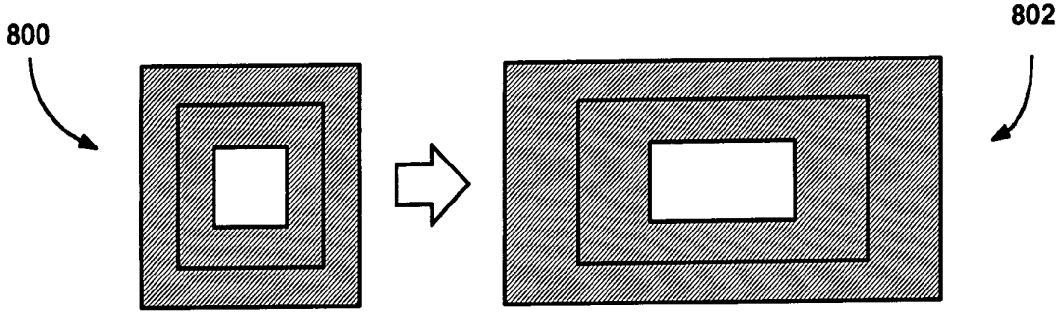


FIG. 8A

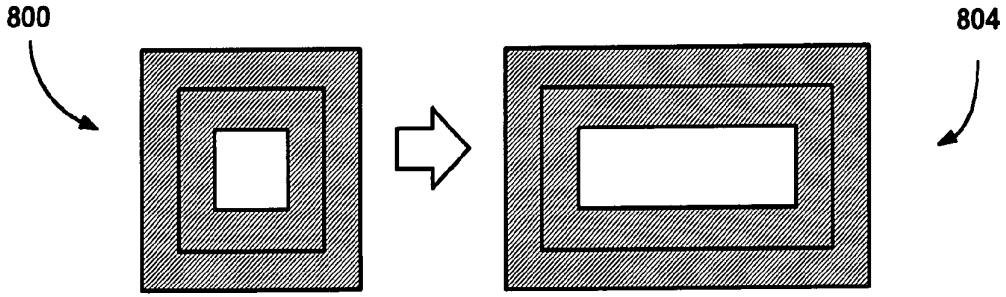


FIG. 8B

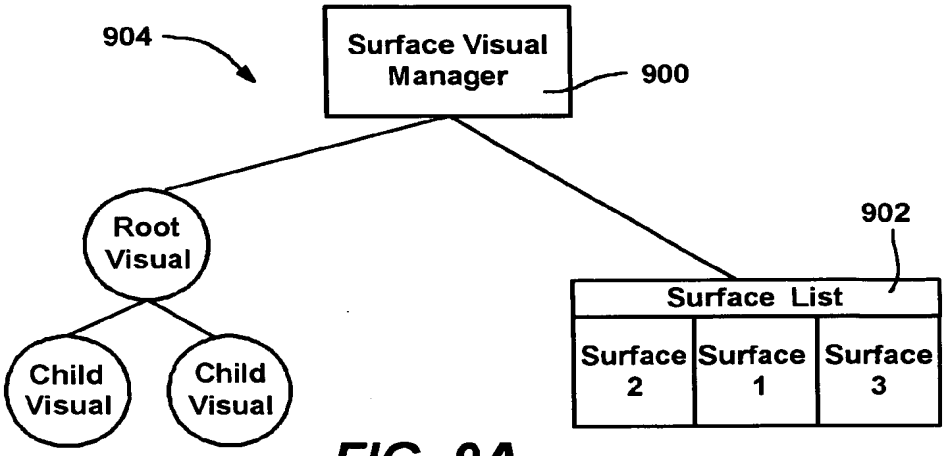

904
Surface Visual Manager
900
Root Visual
902
Surface List
Surface 2
Surface 1
Surface 3
Child Visual
Child Visual

FIG. 9A

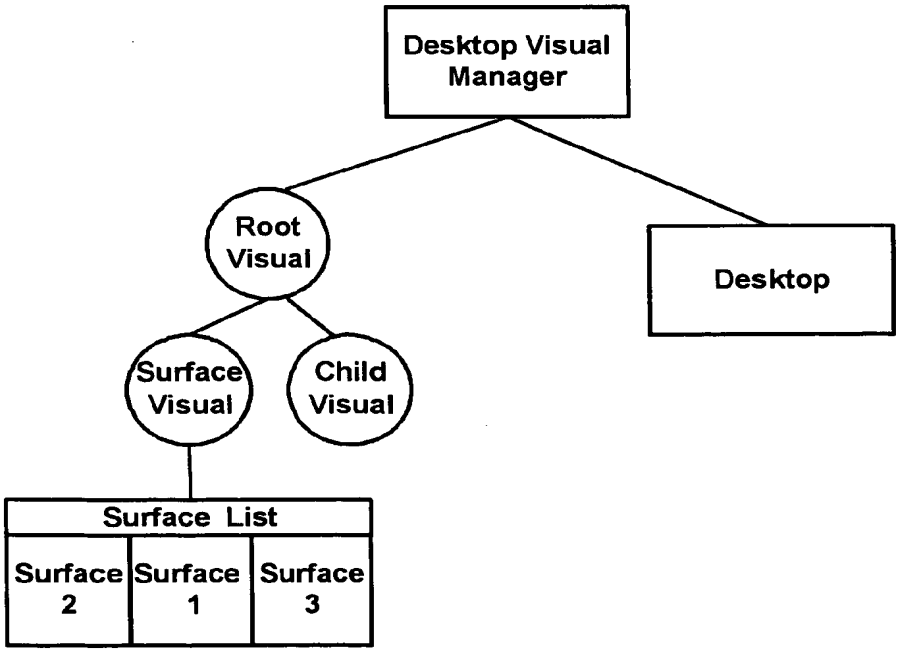

Desktop Visual Manager
Root Visual
Desktop
Surface Visual
Child Visual
Surface List
Surface 2
Surface 1
Surface 3

FIG. 9B

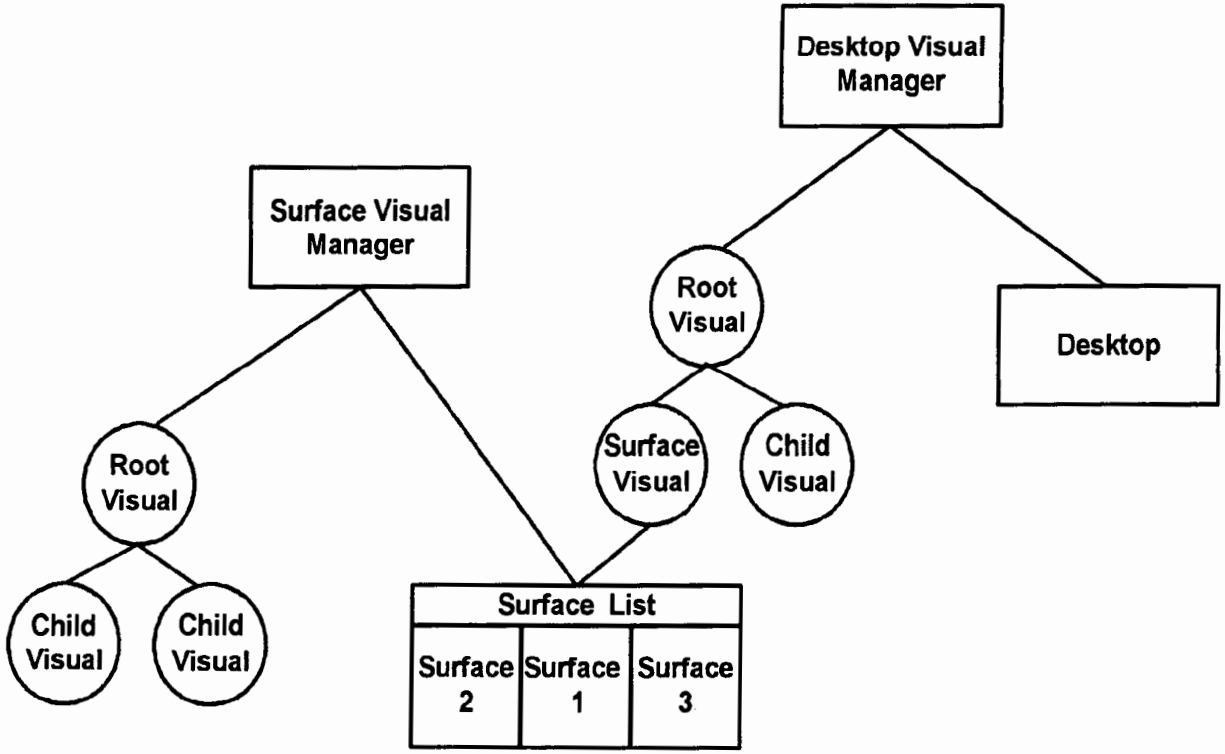

Desktop Visual Manager
Surface Visual Manager
Root Visual
Desktop
Root Visual
Surface Visual
Child Visual
Child Visual
Child Visual
Surface List
Surface 2
Surface 1
Surface 3

FIG. 9C

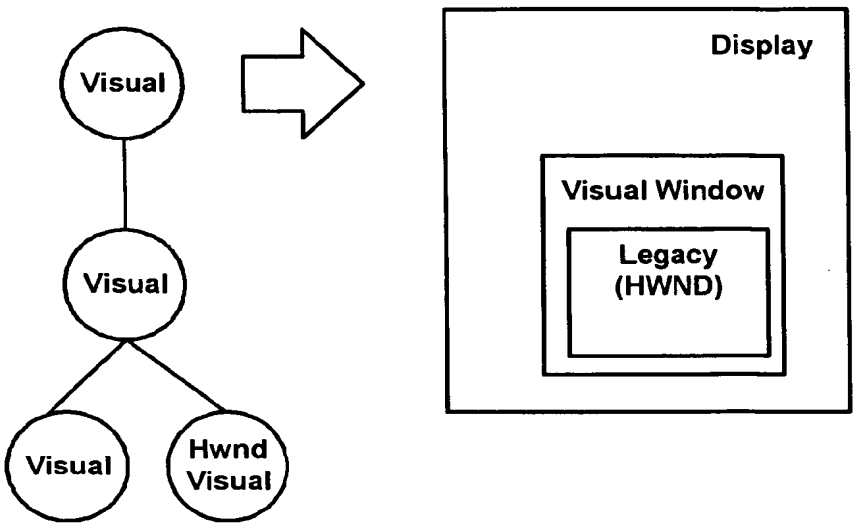


FIG. 10A

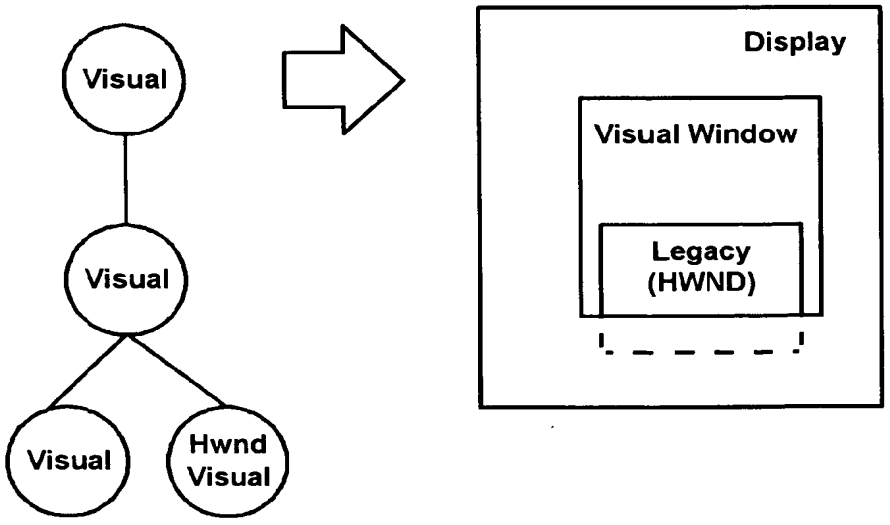


FIG. 10B

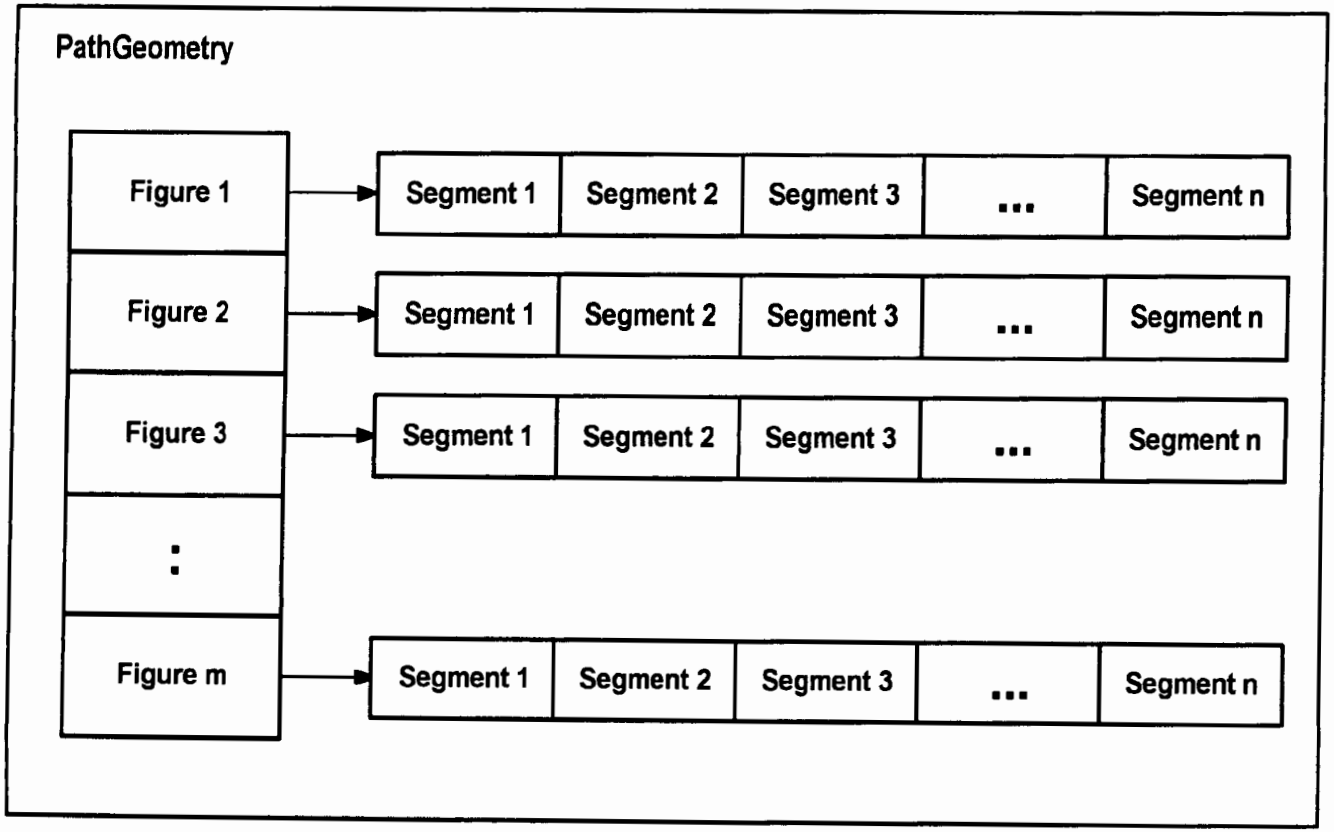

PathGeometry
Figure 1
Figure 2
Figure 3
Figure m
Segment 1
Segment 2
Segment 3
...
Segment n

FIG. 13

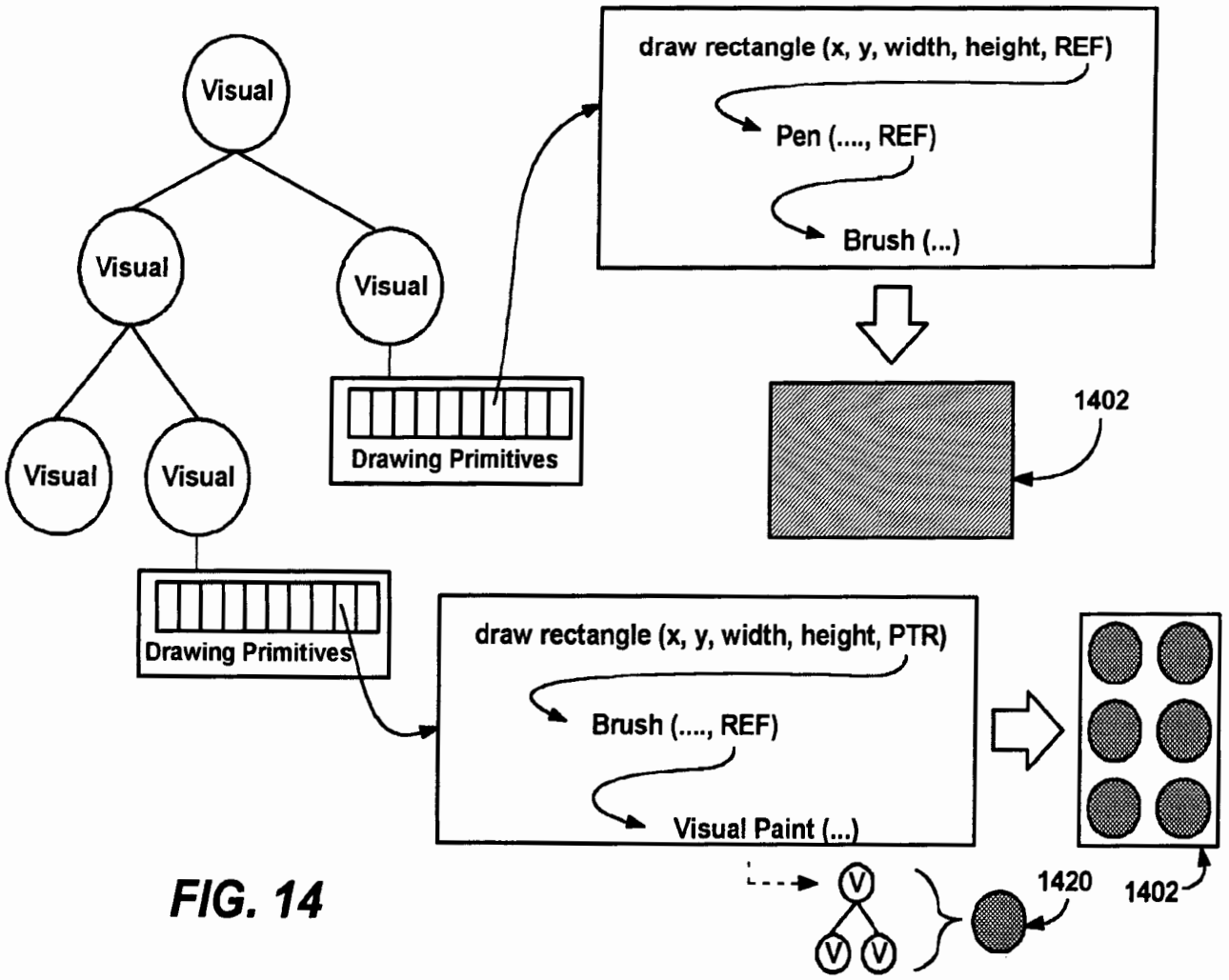

Visual
Visual
Visual
Visual
Visual
Drawing Primitives
Drawing Primitives
draw rectangle (x, y, width, height, REF)
Pen (...., REF)
Brush (...)
1402
draw rectangle (x, y, width, height, PTR)
Brush (...., REF)
Visual Paint (...)
V
V
V
1420
1402

FIG. 14

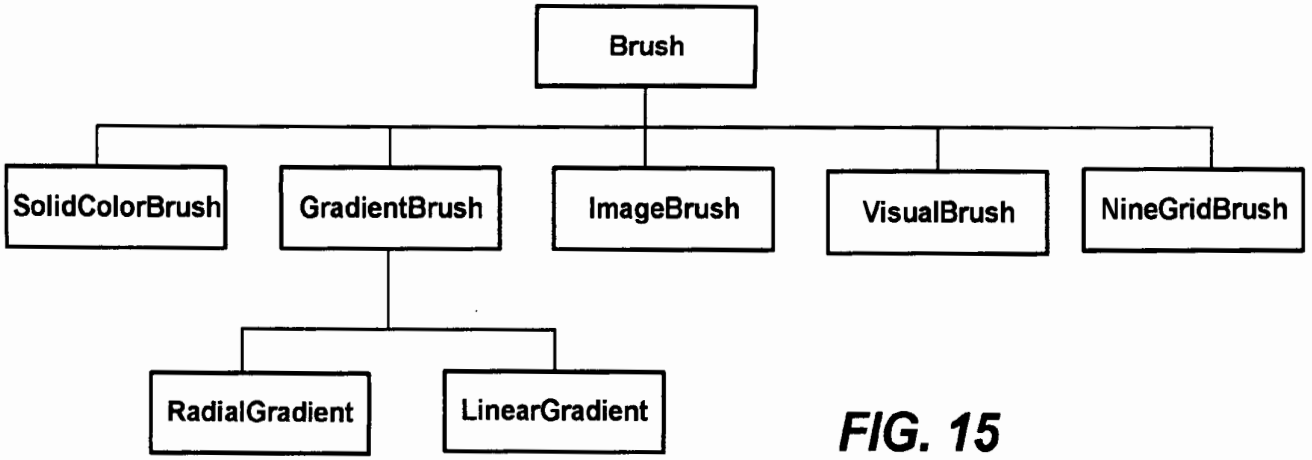

Brush
SolidColorBrush
GradientBrush
ImageBrush
VisualBrush
NineGridBrush
RadialGradient
LinearGradient

FIG. 15

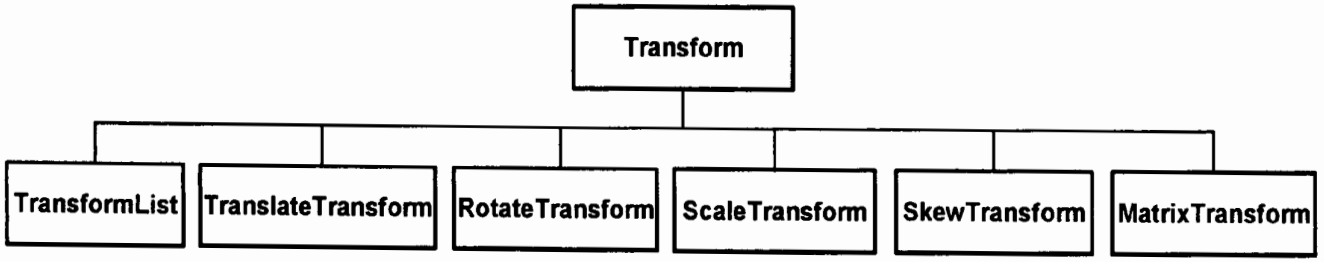

Transform
TransformList
TranslateTransform
RotateTransform
ScaleTransform
SkewTransform
MatrixTransform

FIG. 24

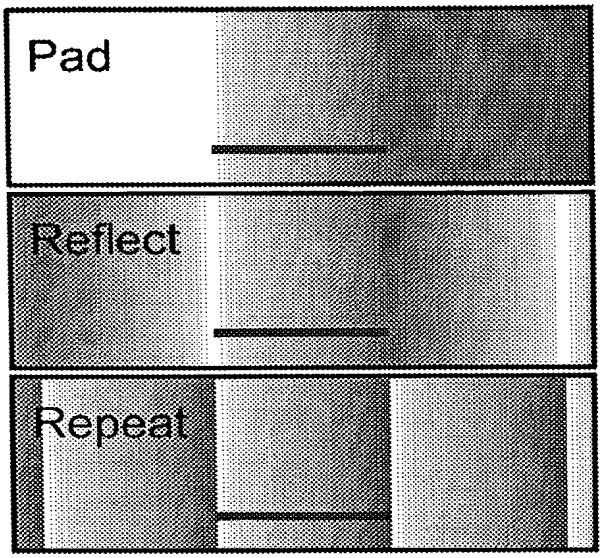


FIG. 16

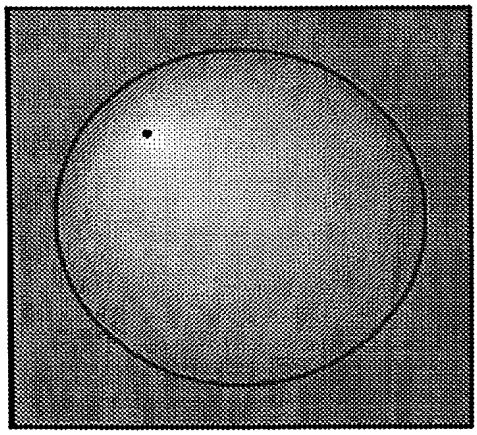


FIG. 17

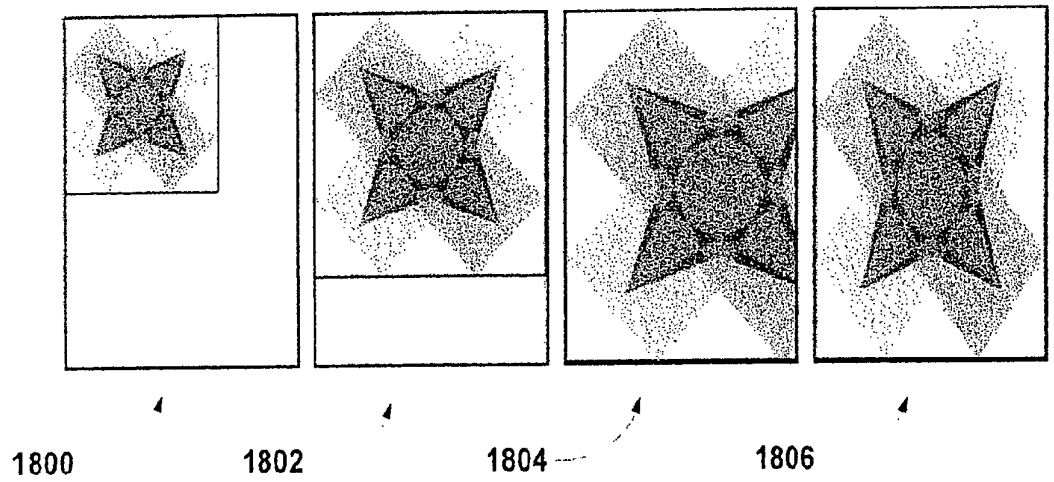


FIG. 18

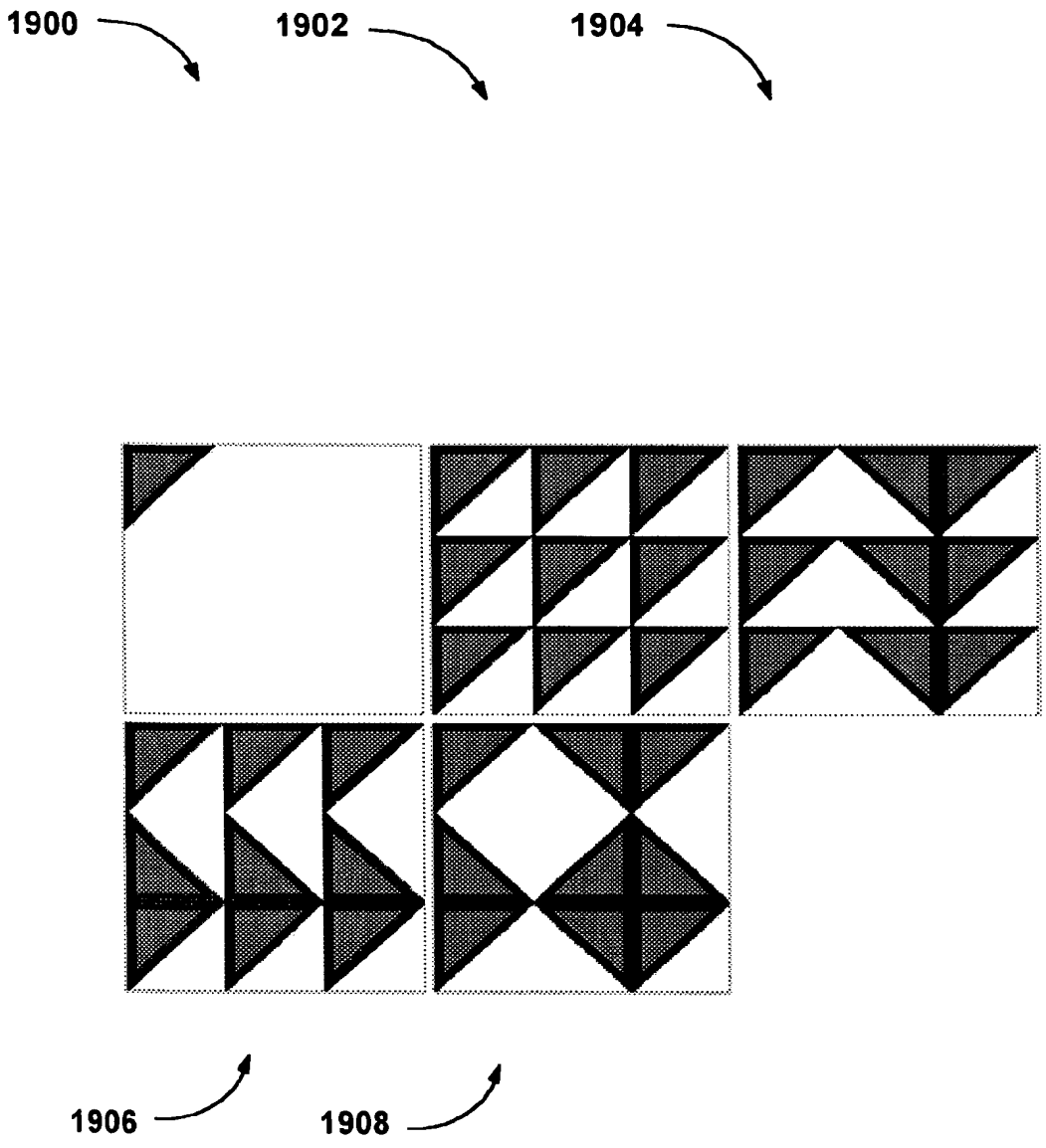
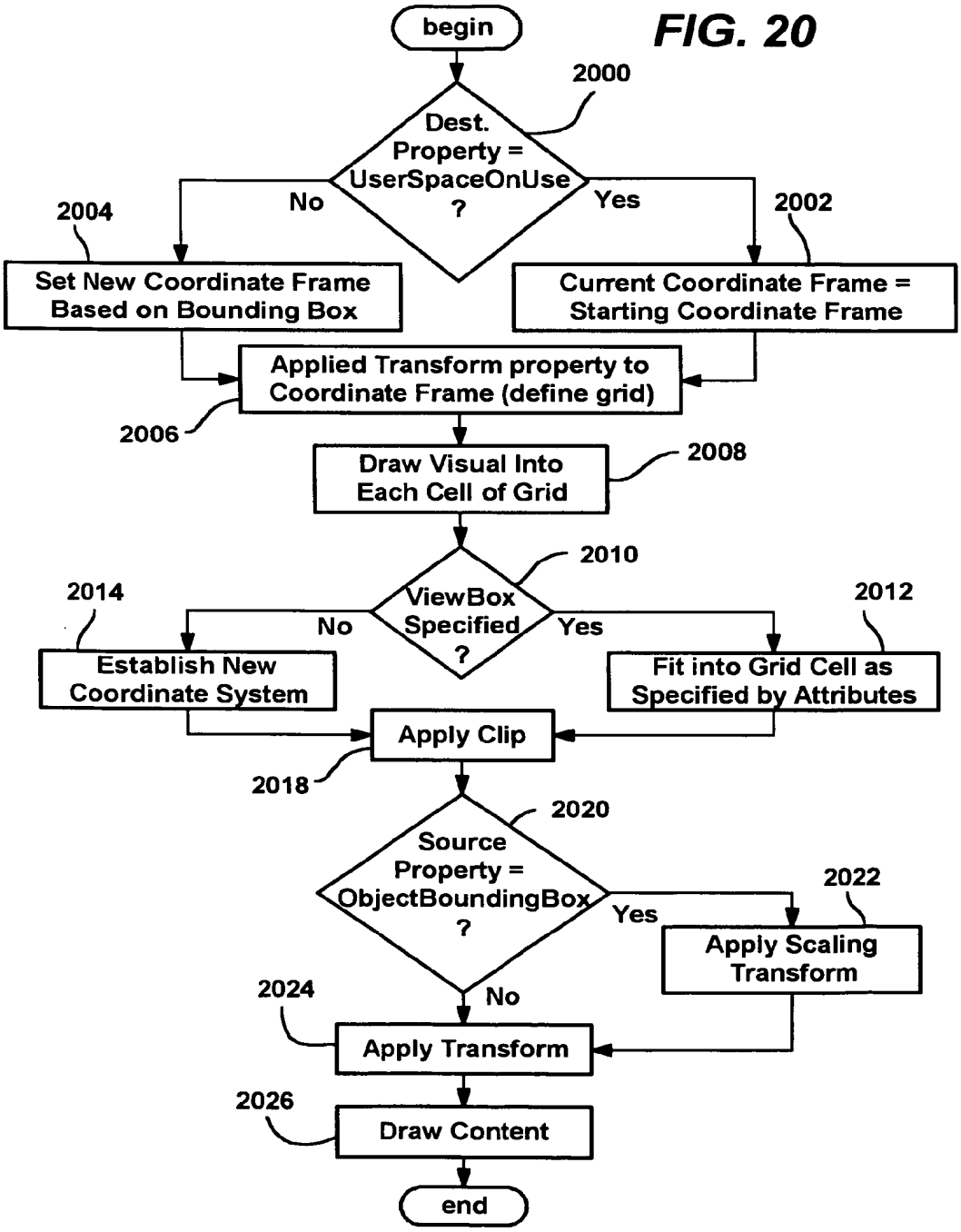


FIG. 19

FIG. 20


begin
2000
Dest. Property = UserSpaceOnUse ?
No
Yes
2004
2002
Set New Coordinate Frame Based on Bounding Box
Current Coordinate Frame = Starting Coordinate Frame
Applied Transform property to Coordinate Frame (define grid)
2006
Draw Visual Into Each Cell of Grid
2008
2010
ViewBox Specified ?
2014
2012
No
Yes
Establish New Coordinate System
Fit into Grid Cell as Specified by Attributes
Apply Clip
2018
2020
Source Property = ObjectBoundingBox ?
2022
Yes
Apply Scaling Transform
2024
No
Apply Transform
2026
Draw Content
end

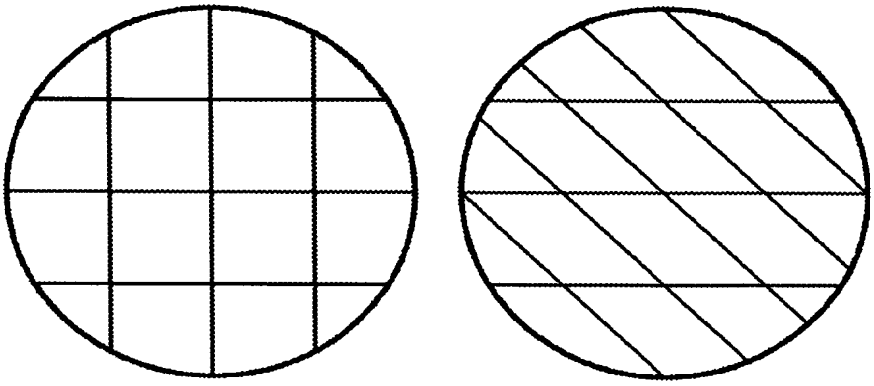


FIG. 21

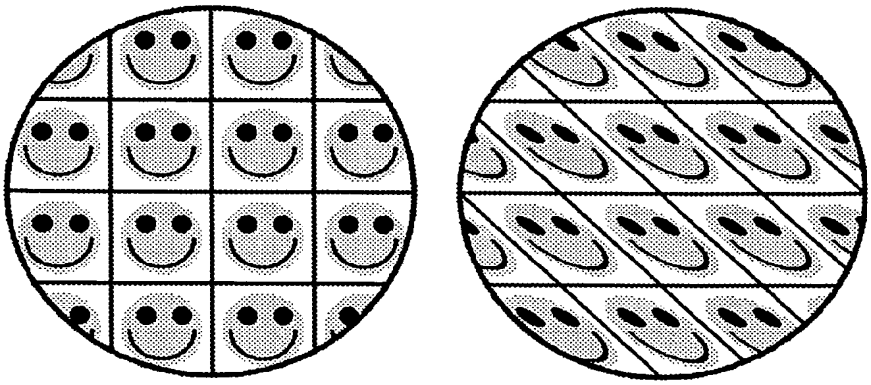


FIG. 22

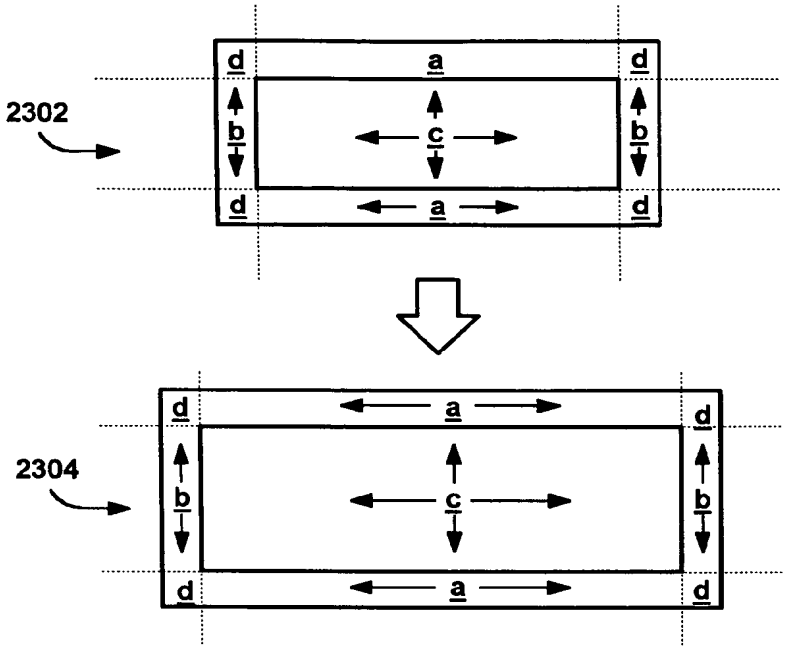

2302
d
a
d
b
c
b
d
a
d
2304
d
a
d
b
c
b
d
a
d

FIG. 23

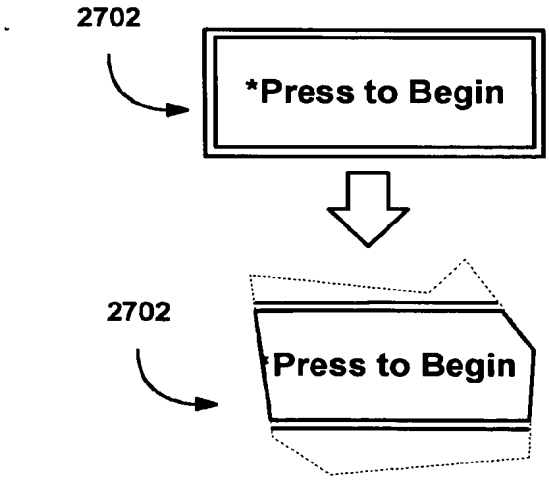

2702
*Press to Begin
2702
*Press to Begin

FIG. 27

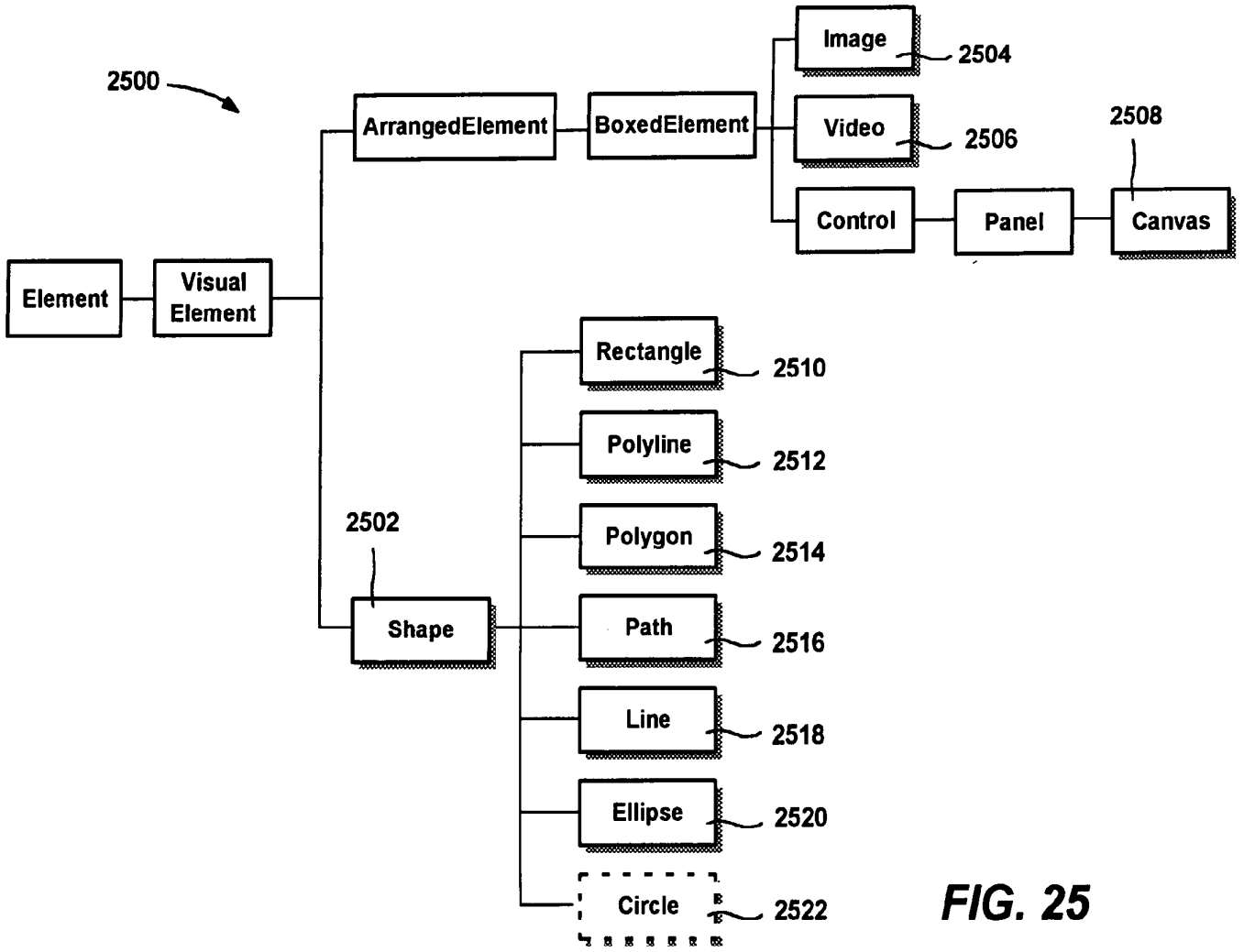

2500
Element
Visual Element
ArrangedElement
BoxedElement
Image
2504
Video
2506
Control
Panel
Canvas
2508
2502
Shape
Rectangle
2510
Polyline
2512
Polygon
2514
Path
2516
Line
2518
Ellipse
2520
Circle
2522

FIG. 25

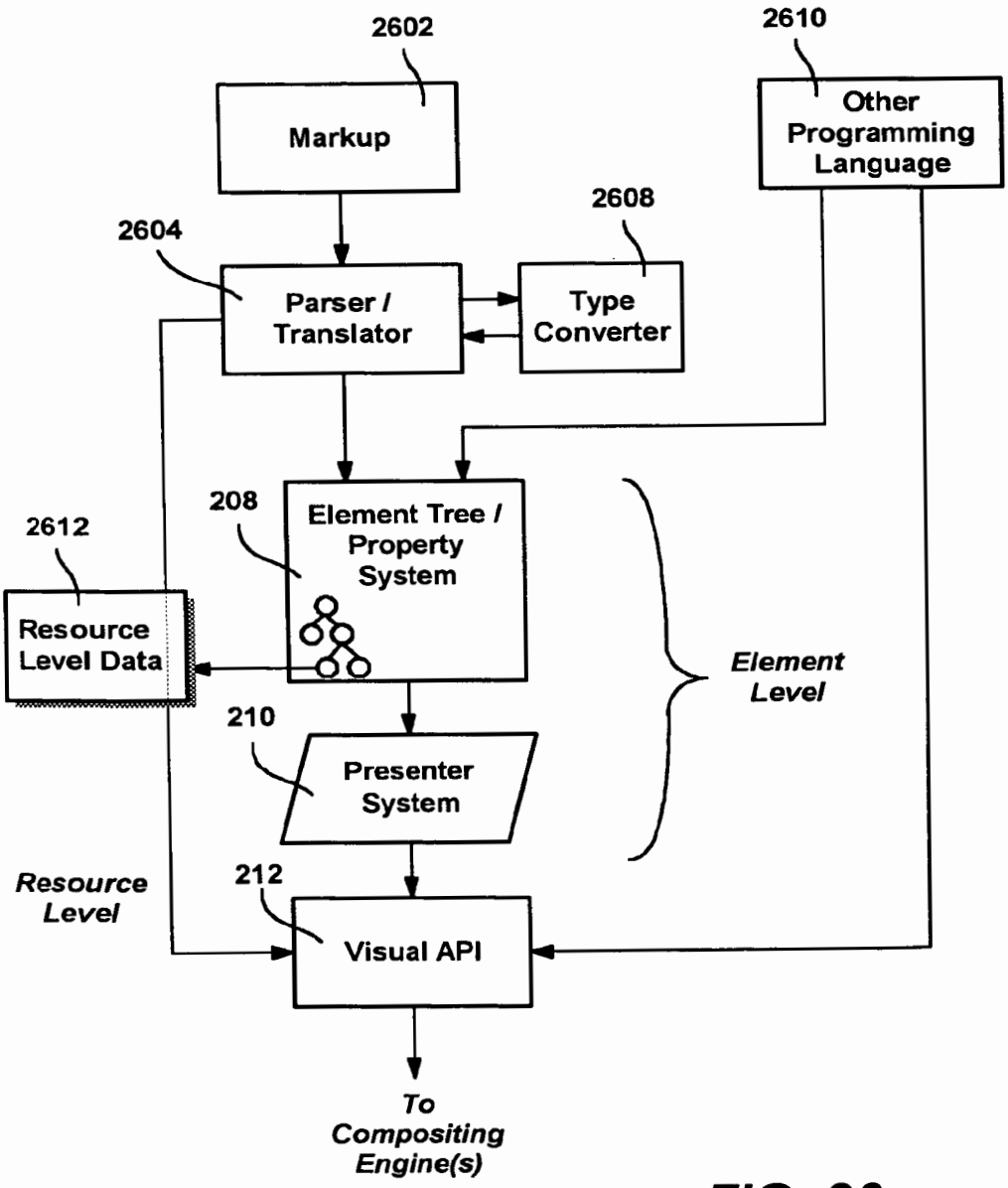

2602
Markup
2610
Other Programming Language
2608
2604
Parser / Translator
Type Converter
208
Element Tree / Property System
2612
Resource Level Data
Element Level
210
Presenter System
Resource Level
212
Visual API
To Compositing Engine(s)

FIG. 26

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United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
17/121,919	12/15/2020		320	BEEL3002CIPC2/TL		

CONFIRMATION NO. 2764

FILING RECEIPT

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625 SLATERS LANE
FOURTH FLOOR
ALEXANDRIA, VA 22314-1176

OC000000124172819

Date Mailed: 03/18/2021

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Guy COEN, Aalst, BELGIUM;

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Assignment For Published Patent Application

BARCO N.V., Kortrijk, BELGIUM

Power of Attorney: The patent practitioners associated with Customer Number 23364

Domestic Priority data as claimed by applicant

This application is a CON of 14/725,401 05/29/2015 PAT 10904103
which is a CON of 14/212,170 03/14/2014 PAT 9083769
which is a CIP of 13/270,659 10/11/2011 PAT 8756348
and is a CIP of PCT/EP2012/068166 09/14/2012
and said 13/270,659 10/11/2011
claims benefit of 61/534,592 09/14/2011
and said PCT/EP2012/068166 09/14/2012
claims benefit of 61/635,219 04/18/2012
and claims benefit of 61/534,592 09/14/2011
and is a CON of 13/270,659 10/11/2011 PAT 8756348

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 03/17/2021
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/121,919**
Projected Publication Date: To Be Determined - pending completion of Missing Parts
Non-Publication Request: No
Early Publication Request: No
Title

ELECTRONIC TOOL AND METHODS FOR MEETINGS

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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Title 37, Code of Federal Regulations, 5.11 & 5.15

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The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/121,919	12/15/2020	Koen Simon Herman BEEL	BEEL3002CIPC2/TL

CONFIRMATION NO. 2764

23364
BACON & THOMAS, PLLC
625 SLATERS LANE
FOURTH FLOOR
ALEXANDRIA, VA 22314-1176

FORMALITIES LETTER

OC000000124172820

Date Mailed: 03/18/2021

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The specification does not include at least one claim.
  A complete specification as prescribed by 35 U.S.C. 112 is required.
  Applicant must submit at least one claim. If more than 3 independent claims, more than 20 total claims, and/or a multiple dependent claim are submitted, excess claims fees are required at the time of submission of such claims (see 37 CFR 1.16(h)-(j)).
- The application search fee must be submitted.
- The application examination fee must be submitted.
- Surcharge as set forth in 37 CFR 1.16(f) must be submitted.
  The surcharge is due for any one of:
  - late submission of the basic filing fee, search fee, or examination fee,
  - late submission of inventor's oath or declaration,
  - filing an application that does not contain at least one claim on filing, or
  - submission of an application filed by reference to a previously filed application.

SUMMARY OF FEES DUE:

The fee(s) required within **TWO MONTHS** from the date of this Notice to avoid abandonment is/are itemized below. No entity status discount is in effect. If applicant is qualified for small entity status, a written assertion of small entity status must be submitted to establish small entity status. (See 37 CFR 1.27). If applicant is qualified for micro entity status, an acceptable Certification of Micro Entity Status must be submitted to establish micro entity status. (See 37 CFR 1.29 and forms PTO/SB/15A and 15B.)

- $ **160** surcharge.
- $ **700** search fee.
- $ **800** examination fee.
- $(**0**) previous unapplied payment amount.
- $ **1660** TOTAL FEE BALANCE DUE.

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice". https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at 1-866-217-9197 or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/tnguyen/

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 17/121,919

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	320
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	700
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	800
TOTAL CLAIMS (37 CFR 1.16(i))	0 minus 20 =	*			OR	x 100 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	0 minus 3 =	*				x 480 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1820

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17121919
Filing Date	2020-12-15
First Named Inventor	Koen Simon Herman BEEL
Art Unit	TBD
Examiner Name	TBD
Attorney Docket Number	BEEL3002CIPC2/TL

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20090064302		2009-03-05	Colella	
	2	20110078716		2011-03-31	MacWan	

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							

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NON-PATENT LITERATURE DOCUMENTS Remove

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17121919
	Filing Date	2020-12-15
	First Named Inventor	Koen Simon Herman BEEL
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	BEEL3002CIPC2/TL

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	Non-Final Office Action in related U.S. application 16/812,755 dated February 19, 2021.	

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17121919
	Filing Date	2020-12-15
	First Named Inventor	Koen Simon Herman BEEL
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	BEEL3002CIPC2/TL

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Thomas Lee/	Date (YYYY-MM-DD)	2021-03-17
Name/Print	THOMAS LEE	Registration Number	66396

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	42201381
Application Number:	17121919
International Application Number:	
Confirmation Number:	2764
Title of Invention:	ELECTRONIC TOOL AND METHODS FOR MEETINGS
First Named Inventor/Applicant Name:	Koen Simon Herman BEEL
Customer Number:	23364
Filer:	Thomas Lee/Shelly Darrenkamp
Filer Authorized By:	Thomas Lee
Attorney Docket Number:	BEEL3002CIPC2/TL
Receipt Date:	17-MAR-2021
Filing Date:	
Time Stamp:	09:54:34
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	BEEL3002CIPC2_IDS_SB08.pdf	1034412 bcd538f3b56d61ae4418d735d43b3837e7daa28a	no	4

Warnings:

Information:					
2	Non Patent Literature	OA1_19Feb2021.pdf	2904271 e528350d43ee0051813ebbd9ab986aca2fdfadbd	no	71
Warnings:					
Information:					
			Total Files Size (in bytes):	3938683	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17121919
Filing Date	2020-12-15
First Named Inventor	Koen Simon Herman BEEL
Art Unit	TBD
Examiner Name	TBD
Attorney Docket Number	BEEL3002CIPC2/TL

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

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U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20060101116		2006-05-11	Rittman	

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	101566940	CN	A	2009-10-28			×

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17121919
	Filing Date	2020-12-15
	First Named Inventor	Koen Simon Herman BEEL
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	BEEL3002CIPC2/TL

	1	Chinese Office Action in corresponding Chinese Application No. 201810229467.1, dated January 8, 2021.	X
	2	U.S. Office Action in corresponding U.S. Application No. 16/852,790, dated January 14, 2021.	☐

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17121919
	Filing Date	2020-12-15
	First Named Inventor	Koen Simon Herman BEEL
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	BEEL3002CIPC2/TL

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OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Thomas Lee/	Date (YYYY-MM-DD)	2021-01-28
Name/Print	THOMAS LEE	Registration Number	66396

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

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DESCRIPTION CN101566940A

10 Method and device for realizing universal serial bus audio transmission of wireless data terminal

[0001]

14 Technical field

[0002]

18 The invention relates to audio data transmission technology, in particular to a method and device for realizing universal serial bus audio transmission of a wireless data terminal.

[0003]

23 Background technique

[0004]

27 At present, Time Division-Synchronous Code Division Multiple Access (TD-SCDMA, Time Division-Synchronous Code Division Multiple Access) technology, as the third-generation mobile communication standard proposed by China, has matured day by day. With the support of TD-SCDMA technology, it can download data and The speed of uploading data to the network has been greatly improved, and the increase in speed will inevitably promote the increase of users' demand for audio services and video services.

[0005]

35 In the prior art, when processing audio data, the wireless data terminal directly sends the analog audio signal received from the air interface to the corresponding radio frequency, codec and other hardware devices for demodulation and decoding, and finally it is played by the speaker; The collected analog audio signal that

needs to be sent is encoded and modulated by the corresponding codec, radio frequency and other hardware devices and then sent out.

40 The disadvantage of this way of processing audio data is that, due to the need to encode and decode audio data, the wireless data terminal must be equipped with a corresponding codec, which increases hardware costs.

[0006]

45 To overcome the shortcomings of the aforementioned audio data processing methods, a currently popular implementation method is Universal Serial Bus Audio Transmission (VOUSB, Voice Over USB). The implementation of this method is briefly described with a widely used PC as a terminal device.

48 The wireless data terminal transmits the demodulated audio data to the PC through the USB interface for decoding and other processing; similarly, the audio data processed in the PC is transmitted to the wireless data terminal through the USB interface.

51 In this way, the wireless data terminal no longer needs a codec on the hardware, reducing the hardware cost. Moreover, compared to wireless data terminals, PCs have stronger computing power and more memory resources, so they have more powerful processing capabilities for audio data and can perform richer processing, such as: denoising, retouching, Mixing and other processing.

[0007]

58 Figure 1 is a schematic diagram of the implementation method of VOUSB in the prior art. The air interface of the wireless data terminal receives the analog audio signal sent by the remote device via the wireless communication network and transmits it to the radio frequency for demodulation. After that, the baseband processing module decodes it. The tuned audio data is amplified and digitally filtered to obtain a pulse code modulation (PCM, Pulse Code Modulation) code stream, and then transmit the PCM code stream to the USB driver on the wireless data terminal side, and the USB driver on the wireless data terminal side converts the PCM The code stream is transmitted to the USB endpoint of the wireless data terminal. Finally, in accordance with the batch transmission method of the USB standard, the PCM code stream is transmitted to the USB endpoint of the terminal device via the USB endpoint of the wireless data terminal.

67 Here, the role of the USB driver on the wireless data terminal side is to receive audio data from the baseband processing module and transmit it to the USB endpoint of the wireless data terminal, or read audio data from the USB endpoint of the wireless data terminal and transmit it to the baseband processing module. The characteristic of the USB standard batch transmission method is to support a large amount of data transmission within an uncertain time, which can guarantee that the data can be transmitted, but the transmission bandwidth and delay are not guaranteed, so the real-time performance of data transmission is not good; In addition, for the audio data transmitted in the USB standard batch transmission mode, the terminal device does not have a standard driver to process it. To process the audio data, it needs to be implemented with the help of a user interface (UI, User Interface). The process is as follows:

[0008]

79 For the PCM code stream sent by the wireless data terminal to the USB endpoint of the terminal device, the

terminal device side USB driver reads it, and the terminal device UI reads and releases it from the terminal device side USB driver. After that, the PCM code stream Transfer to a physical sound card.

82 The physical sound card decodes the transmitted PCM code stream, then obtains the analog audio signal through A/D conversion and other processing, and finally sends the analog audio signal to the speaker for playback. The physical sound card may be a sound card with a PCI interface or a USB sound card. Here, the role of the USB driver on the terminal device side is to read audio data from the USB endpoint of the terminal device and transmit it to the UI, or obtain audio data from the UI and transmit it to the USB endpoint of the terminal device.

[0009]

91 However, in the current implementation method based on VOUSB, the USB audio data transmission channel between the wireless data terminal and the terminal device is only used as the data transmission channel. The problem that this brings is that there is no special optimization for the characteristics of audio data transmission. In terms of real-time performance, it has affected the practical application of VOUSB.

[0010]

98 Summary of the invention

[0011]

102 In view of this, the main purpose of the present invention is to provide a method and device for realizing universal serial bus audio transmission of a wireless data terminal, making full use of the powerful ability of the terminal device to process audio data and enhancing the practical application effect of VOUSB.

[0012]

108 In order to achieve the above objective, the technical scheme of the present invention is achieved as follows:

[0013]

112 The invention discloses a method for realizing universal serial bus audio transmission of a wireless data terminal. The USB audio data transmission channel between the wireless data terminal and the terminal device is enumerated as a USB sound card device. The key is that the method includes the following steps:

[0014]

118 The wireless data terminal sends audio data to the terminal device through the USB sound card device, and the terminal device accesses the USB sound card device through its own audio device driver to obtain audio data; the terminal device sends audio to the USB sound card device through its own audio device driver Data, the wireless data terminal receives the audio data through the USB sound card device.

[0015]

125 The enumerating the USB audio data transmission channel between the wireless data terminal and the terminal device as a USB sound card device includes: the wireless data terminal defines the wireless data terminal USB endpoint that transmits audio data as a sound card, and sets the wireless data terminal USB The endpoint is connected to the USB endpoint of the terminal device through a USB data cable; the terminal device requests the wireless data terminal to obtain the device descriptor, configuration descriptor, and descriptor set of the connected sound card. After the wireless data terminal receives the request, it sends the device description to the terminal device According to the acquired device descriptor, configuration descriptor, and descriptor set, the terminal device determines the driver that can provide USB, loads the corresponding audio device driver that conforms to the USB specification, and the audio device driver performs the operation on the sound card Configure to get a USB sound card device.

[0016]

138 The terminal device includes an audio device driver, a user interface UI, and a physical sound card. The terminal device accesses the USB sound card device to obtain audio data through its own audio device driver, including: the audio device driver accesses the USB sound card device interface The USB sound card device reads and releases the pulse code modulation PCM code stream transmitted to the USB sound card device; the UI accesses the audio device driver through the audio device interface, and transmits the PCM code stream to the physical sound card.

[0017]

147 The terminal device includes an audio device driver, a user interface UI, and a physical sound card. The terminal device sends audio data to the USB sound card device through its own audio device driver, including: the physical sound card obtains a PCM code stream from an analog audio signal; UI Obtain the PCM code stream from the physical sound card, and transmit the PCM code stream to the audio device driver through the audio device interface of the audio device driver, and the audio device driver sends the PCM code stream to the USB sound card device.

[0018]

156 The invention also discloses a device for realizing universal serial bus audio transmission of a wireless data terminal. The device includes: a wireless data terminal, a USB sound card device and a terminal device,

[0019]

161 The wireless data terminal is used to send audio data to the terminal device through a USB sound card device, and to receive audio data from the terminal device through the USB sound card device.

[0020]

166 USB sound card device, used to transmit audio data between the wireless data terminal and the terminal device;

[0021]

171 The terminal device is used to access the USB sound card device through its own audio device driver to obtain audio data from the wireless data terminal, and send audio data to the USB sound card device through its own audio device driver.

[0022]

177 The USB sound card device includes: a wireless data terminal-side USB driver, a wireless data terminal USB endpoint, and a terminal device USB endpoint, wherein the wireless data terminal-side USB driver is connected to the baseband processing module of the wireless data terminal; the wireless data terminal The USB endpoint is connected with the USB endpoint of the terminal device through a USB data line; the USB endpoint of the terminal device is connected with the audio device driver of the terminal device.

[0023]

185 The terminal device includes an audio device driver, a user interface UI, and a physical sound card. The audio device driver is used to access the USB endpoint of the terminal device by accessing the USB sound card device interface, and the PCM code stream transmitted to the USB endpoint of the terminal device Read and release; UI is used to access the audio device driver through the audio device interface, and transmit the PCM code stream to the physical sound card; the physical sound card is used to obtain the analog audio signal from the PCM code stream.

[0024]

194 The terminal device includes an audio device driver, a user interface UI, and a physical sound card. The physical sound card is used to obtain the PCM code stream from the analog audio signal; the UI is used to obtain the PCM code stream from the physical sound card and drive the audio through the audio device. The device interface transmits the PCM code stream to the audio device driver; the audio device driver is used to send the PCM code stream to the USB endpoint of the terminal device.

[0025]

202 It can be seen that, compared with the prior art, the method and device for realizing universal serial bus audio transmission of a wireless data terminal provided by the present invention has the following characteristics and advantages:

[0026]

208 First, the USB audio data transmission channel between the wireless data terminal and the terminal device is enumerated into a USB sound card device to transmit audio data using the standard USB AUDIO CLASS defined by the USB specification, and the operating system on the widely used terminal device Both provide the implementation of audio device drivers conforming to the USB specification by default. Therefore, the audio device driver accesses the USB endpoint of the terminal device by accessing the USB sound card device interface; the audio device driver reads the audio data read from the USB endpoint And release.

[0027]

217 Secondly, using the USB standard synchronous transmission method to transmit audio data has good real-time performance, and the terminal device has a standard driver for the synchronous transmission method, that is, the audio device driver, which reads and releases the audio data of the terminal device USB endpoint. It is done in the audio device driver, and its processing priority is higher than that in the application UI. Therefore, when the terminal device system is heavily loaded, the audio data processing still has good real-time performance.

[0028]

226 Finally, the UI accesses the audio device driver through the audio device interface, and transmits the released audio data to the physical sound card.

228 Since the UI accesses the audio device driver through the audio device interface, it reduces the UI's dependence on the audio device driver; the audio device interface is a standard interface, and there is no need to pay attention to the details of the underlying audio device driver implementation, and the operating system has good portability, allowing the UI It is simpler and more reliable to implement.

[0029]

235 According to the characteristics of audio data transmission, the USB audio data transmission channel is abstracted and optimized, and the powerful ability of terminal equipment to process audio data is fully utilized to enhance the practical application effect of VOUSB.

[0030]

241 Description of the drawings

[0031]

245 Figure 1 is a schematic diagram of a method for implementing VOUSB in the prior art;

[0032]

249 Fig. 2 is a schematic diagram of abstracting the USB audio data transmission channel into a USB sound card device in the present invention;

[0033]

254 Fig. 3 is a transmission flow chart of the wireless data terminal as the audio data receiver in the present invention;

[0034]

259 Figure 4 is a transmission flow chart of the wireless data terminal as the audio data sender in the present invention;

[0035]

264 Fig. 5 is a schematic diagram of the device structure for realizing universal serial bus audio transmission of a wireless data terminal in the present invention.

[0036]

269 Detailed ways

[0037]

273 The present invention will be further described in detail below in conjunction with the drawings and specific embodiments.

[0038]

278 Figure 2 is a schematic diagram of abstracting the USB audio data transmission channel into a USB sound card device in the present invention.

280 Compared with Figure 1, in the present invention, the USB sound card application method in the USB specification is used to abstract the USB audio data transmission channel between the wireless data terminal and the terminal device into a USB sound card device.

283 The USB audio data transmission channel refers to the audio data transmission channel including the USB driver on the wireless data terminal side, the USB endpoint of the wireless data terminal, the USB endpoint of the terminal device, and the USB data line between two USB endpoints.

286 The key to abstract the USB audio data transmission channel into a USB sound card device is to enumerate the USB audio data transmission channel into a USB sound card device using the standard USB AUDIO CLASS defined by the USB specification.

289 The enumeration is achieved through the following steps: first, the wireless data terminal side defines the

wireless data terminal USB endpoint that transmits audio data as a sound card, and connects the wireless data terminal USB endpoint to the terminal device USB endpoint through a USB data cable; After that, the terminal device sends a request to the wireless data terminal to request information such as the device descriptor, configuration descriptor, descriptor set, etc. of the connected sound card; after receiving the request, the wireless data terminal sends the requested device descriptor to the terminal device , Configuration descriptors, descriptor sets and other information; then, after the terminal device obtains this information and determines the driver that can provide USB based on this information, it loads the corresponding audio device driver that conforms to the USB specification; finally, the terminal device gets various descriptions After the symbol, it is considered that the information of the connected sound card is complete, and the sound card is configured by the audio device driver. If the configuration is successful, the audio data transmission between the wireless data terminal and the terminal device can be realized.

301 At this point, the enumeration process ends, and the USB audio data transmission channel is enumerated into a USB sound card device.

303 The wireless data terminal is connected with the USB driver of the wireless data terminal side of the USB sound card device; the terminal device is connected with the USB end point of the terminal device of the USB sound card device.

[0039]

309 Different from the audio data processing capabilities of physical sound cards such as ordinary USB sound cards, and can directly send the processed audio data to the speakers for playback, the USB sound card device is characterized by the same access interface and use method as the physical sound card. To the user, it seems to be an actual physical sound card, but in fact, this USB sound card device only has the function of audio data transmission, and does not have the real audio data processing capability. If you want to process the received audio data, Need to rely on the physical sound card on the terminal device to achieve.

315 For the audio data sent by the terminal device to the wireless data terminal, the wireless data terminal will transmit to the remote device through the wireless communication network.

317 The remote device may be a wireless data terminal or terminal device.

318 If the remote device needs to process the received audio data, if the remote device is a terminal device, directly use the physical sound card on the terminal device to process the audio data and play it; if the remote device is a wireless data terminal , The received audio data is transmitted to the terminal device connected to the wireless data terminal through the USB sound card device, and the audio data is processed by the physical sound card on the terminal device and played.

[0040]

326 Since the USB audio data transmission channel between the wireless data terminal and the terminal device is enumerated into a USB sound card device using the standard USB AUDIO CLASS defined by the USB specification, the audio data transmission is realized, and the operating system on the widely used terminal device Both provide the implementation of audio device drivers that comply with the USB specification by default. Therefore, for the audio data sent by the wireless data terminal to the USB endpoint of the USB sound card device, the audio device driver accesses the terminal by accessing the USB sound card device

interface. Device USB endpoint; when accessing the terminal device USB endpoint, the audio device driver reads and releases the audio data sent to the terminal device USB endpoint. Compared with the existing audio data read and released by the application UI, The audio device driver has a higher priority for reading and releasing. Therefore, even when the terminal device system is heavily loaded, the audio data processing still has good real-time performance; in addition to the audio device driver downward access to the terminal device USB endpoint, The audio device interface can also be provided upwards. The audio device interface is a standard interface. When the UI accesses the audio device interface, there is no need to pay attention to the details of the low-level audio device driver implementation, and the operating system is portable. The UI can be accessed through the audio device interface The audio device drives and transfers the audio data to the physical sound card, which reduces the UI's dependence on the audio device drive, and makes the UI simpler and more reliable.

[0041]

346 Specifically, the process of using a USB sound card device to implement audio data transmission is shown in Figure 3 and Figure 4.

[0042]

351 Figure 3 is a transmission flow chart of a wireless data terminal as a receiver of audio data. The transmission of audio data includes the following steps:

[0043]

356 Step 301: The air interface of the wireless data terminal receives the analog audio signal sent by the remote device via the wireless communication network, and transmits it to the radio frequency and other hardware for demodulation. After that, the baseband processing module amplifies the demodulated audio data. Digital filter processing, get PCM code stream.

[0044]

363 Step 302: The PCM code stream obtained after processing is transmitted by the baseband processing module of the wireless data terminal to the USB driver of the wireless data terminal side of the USB sound card device; after that, according to the synchronous transmission mode of the USB standard, the PCM code stream passes through the USB endpoint of the wireless data terminal And the USB data line is transferred to the USB endpoint of the terminal device of the USB sound card device.

[0045]

371 Step 303: After the PCM code stream is transmitted to the terminal device USB endpoint, the audio device driver of the terminal device accesses the terminal device USB endpoint by accessing the USB sound card device interface, and reads the PCM code stream transmitted to the terminal device USB endpoint After

fetching and releasing, the UI accesses the audio device driver through the audio device interface, and transmits the PCM code stream to the physical sound card.

[0046]

379 Step 304: The physical sound card decodes the transmitted PCM code stream and processes the D/A conversion to obtain an analog audio signal. Finally, the analog audio signal is transmitted to the speaker for playback.

[0047]

385 Figure 4 is a transmission flow chart of a wireless data terminal as a sender of audio data. The transmission of audio data includes the following steps:

[0048]

390 Step 401: The microphone of the terminal device transmits the collected analog audio signal to the physical sound card, and the physical sound card performs A/D conversion, encoding and other processing on it to obtain a digital audio signal in the form of a PCM code stream.

[0049]

396 Step 402: The UI of the terminal device obtains the PCM code stream from the physical sound card, and transmits the PCM code stream to the audio device driver through the audio device interface driven by the audio device. The audio device driver compresses the PCM code stream, and then the audio device driver Return the PCM code stream to the terminal device USB endpoint of the USB sound card device by accessing the USB sound card device interface.

[0050]

404 Step 403: After the PCM code stream is transmitted to the USB endpoint of the terminal device of the USB sound card device, according to the synchronous transmission mode of the USB standard, the PCM code stream is transmitted to the wireless data terminal USB endpoint of the USB sound card device through the USB data line.

[0051]

411 Step 404: The baseband processing module of the wireless data terminal obtains the PCM code stream transmitted to the USB endpoint of the wireless data terminal through the USB driver on the wireless data terminal side, performs amplification and digital filtering, and modulates by radio frequency to obtain an analog audio signal. Finally, The air interface is sent to the remote device via the wireless communication network.

[0052]

419 In order to realize the above method, the present invention also provides a device for realizing universal serial bus audio transmission of a wireless data terminal. As shown in FIG. 5, the device is mainly composed of a wireless data terminal, a USB sound card device, and a terminal device.

[0053]

425 Among them, the wireless data terminal is used to send audio data to the terminal device through a USB sound card device; to receive audio data from the terminal device through the USB sound card device.

[0054]

430 USB sound card device, used to transmit audio data between the wireless data terminal and the terminal device.

[0055]

435 The terminal device is used to access the USB sound card device through its own audio device driver to obtain audio data from the wireless data terminal, and send audio data to the USB sound card device through its own audio device driver.

[0056]

441 Specifically, the audio device driver of the terminal device accesses the USB endpoint of the terminal device by accessing the USB sound card device interface, reads and releases the audio data transmitted to the USB endpoint of the terminal device, and then further transmits the audio data to The physical sound card is decoded, D/A converted, and finally played by the speaker; the audio data collected by the microphone, and further A/D converted and encoded by the physical sound card, is transmitted by the UI to the audio device driver for compression, and then the audio device The driver returns to the terminal device USB endpoint by accessing the USB sound card device interface.

[0057]

451 The foregoing descriptions are only preferred embodiments of the present invention, and are not used to limit the protection scope of the present invention.

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CLAIMS CN101566940A

1.

13 1、A method for realizing universal serial bus audio transmission of a wireless data terminal is characterized in that the USB audio data transmission channel between the wireless data terminal and the terminal device is enumerated as a USB sound card device, and the method includes the following steps:

16 The wireless data terminal sends audio data to the terminal device through the USB sound card device, and the terminal device accesses the USB sound card device through its own audio device driver to obtain the audio data;

19 The terminal device sends audio data to the USB sound card device through its own audio device driver, and the wireless data terminal receives the audio data through the USB sound card device.

2.

24 2、The method according to claim 1, wherein the enumerating USB audio data transmission channels between the wireless data terminal and the terminal device as a USB sound card device comprises:

26 The wireless data terminal defines the wireless data terminal USB endpoint that transmits audio data as a sound card, and connects the wireless data terminal USB endpoint to the terminal device USB endpoint through a USB data cable;

29 The terminal device requests the wireless data terminal to obtain the device descriptor, configuration descriptor, and descriptor set of the connected sound card. After receiving the request, the wireless data terminal sends the device descriptor, configuration descriptor, and descriptor set to the terminal device;

32 The terminal device determines the driver that can provide USB according to the acquired device descriptor, configuration descriptor, and descriptor set, loads the corresponding audio device driver that conforms to the USB specification, and configures the sound card by the audio device driver to obtain the USB sound card device.

3.

39 3、 The method according to claim 1, wherein the terminal device includes an audio device driver, a user interface UI and a physical sound card,

41 The terminal device accesses the USB sound card device through its own audio device driver to obtain audio data, including: the audio device driver accesses the USB sound card device by accessing the USB sound card device interface, and modulates the PCM code transmitted to the USB sound card device by pulse code The stream is read and released; the UI accesses the audio device driver through the audio device interface, and transmits the PCM code stream to the physical sound card.

4.

49 4、 The method according to claim 1, wherein the terminal device includes an audio device driver, a user interface UI and a physical sound card,

51 The terminal device sends audio data to the USB sound card device through its own audio device driver, including: the physical sound card obtains the PCM code stream from the analog audio signal; the UI obtains the PCM code stream from the physical sound card and uses the audio device interface driven by the audio device The PCM code stream is transmitted to the audio device driver, and the audio device driver sends the PCM code stream to the USB sound card device.

5.

59 5、 A device for realizing universal serial bus audio transmission of a wireless data terminal, characterized in that the device includes: a wireless data terminal, a USB sound card device and a terminal device,

61 The wireless data terminal is used to send audio data to the terminal device through a USB sound card device, and to receive audio data from the terminal device through the USB sound card device.

63 USB sound card device, used to transmit audio data between the wireless data terminal and the terminal device;

64 The terminal device is used to access the USB sound card device through its own audio device driver to obtain audio data from the wireless data terminal, and send audio data to the USB sound card device through its own audio device driver.

6.

70 6、 The device according to claim 5, wherein the USB sound card device comprises: a USB driver on the side of a wireless data terminal, a USB endpoint of a wireless data terminal, and a USB endpoint of a terminal device,

73 The USB driver on the side of the wireless data terminal is connected to the baseband processing module of the wireless data terminal;

75 The USB endpoint of the wireless data terminal is connected to the USB endpoint of the terminal device through a USB data cable;

77 The USB endpoint of the terminal device is connected with the audio device driver of the terminal device.

7.

81 7、 The apparatus according to claim 6, wherein the terminal device comprises an audio device driver, a user interface UI and a physical sound card,

83 The audio device driver is used to access the USB endpoint of the terminal device by accessing the USB sound card device interface, and read and release the PCM code stream transmitted to the USB endpoint of the terminal device;

86 UI is used to access the audio device driver through the audio device interface, and transmit the PCM code stream to the physical sound card;

88 The physical sound card is used to obtain the analog audio signal from the PCM code stream.

8.

92 8、 The method according to claim 6, wherein the terminal device includes an audio device driver, a user interface UI and a physical sound card,

94 The physical sound card is used to obtain the PCM code stream from the analog audio signal;

95 The UI is used to obtain the PCM code stream from the physical sound card, and transmit the PCM code stream to the audio device driver through the audio device interface of the audio device driver;

97 The audio device driver is used to send a PCM code stream to the USB endpoint of the terminal device.

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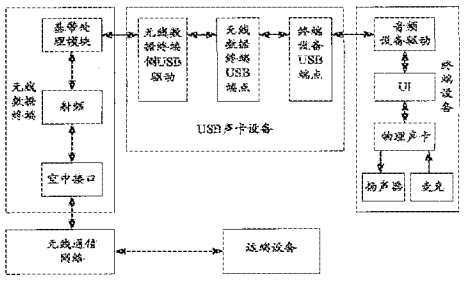
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[54] 发明名称

实现无线数据终端通用串行总线音频传输的方法及装置

[57] 摘要

本发明公开了一种实现无线数据终端通用串行总线音频传输的方法及装置。其方法为将无线数据终端与终端设备之间的 USB 音频数据传输通道，采用 USB 规范定义的标准的 USB AUDIO CLASS 枚举成一个 USB 声卡设备，传输音频数据；该装置包括无线数据终端、USB 声卡设备、终端设备。所述 USB 声卡设备仅传输音频数据，而不对音频数据进行处理；终端设备的音频设备驱动以访问 USB 声卡设备接口的方式访问终端设备 USB 端点，并对音频数据 PCM 码流进行读取和释放，或者，压缩和回传；终端设备的物理声卡对音频数据 PCM 码流进行编解码及 D/A 或 A/D 转换。采用本发明的方法及装置，对 USB 音频数据传输通道进行专门优化，充分利用终端设备处理音频数据的强大能力，增强了 VOUSB 的实际应用效果。



1、一种实现无线数据终端通用串行总线音频传输的方法，其特征在于，将无线数据终端和终端设备之间的USB音频数据传输通道枚举为USB声卡设备，该方法包括以下步骤：

无线数据终端通过所述USB声卡设备向终端设备发送音频数据，终端设备通过自身的音频设备驱动访问所述USB声卡设备获取音频数据；

终端设备通过自身的音频设备驱动向所述USB声卡设备发送音频数据，无线数据终端通过所述USB声卡设备接收该音频数据。

2、根据权利要求1所述的方法，其特征在于，所述将无线数据终端和终端设备之间的USB音频数据传输通道枚举为USB声卡设备，包括：

无线数据终端将传输音频数据的无线数据终端USB端点定义为声卡，并将该无线数据终端USB端点通过USB数据线连接到终端设备USB端点；

终端设备向无线数据终端请求获取所连接声卡的设备描述符、配置描述符、描述符集合，无线数据终端收到请求后，向终端设备发送设备描述符、配置描述符、描述符集合；

终端设备根据获取的设备描述符、配置描述符、描述符集合确定能够提供USB的驱动，加载相应符合USB规范的音频设备驱动，由音频设备驱动对声卡进行配置，得到USB声卡设备。

3、根据权利要求1所述的方法，其特征在于，所述终端设备包括音频设备驱动、用户界面UI和物理声卡，

所述终端设备通过自身的音频设备驱动访问USB声卡设备获取音频数据，包括：音频设备驱动以访问USB声卡设备接口的方式访问所述USB声卡设备，对传输到USB声卡设备的脉冲编码调制PCM码流进行读取和释放；UI通过音频设备接口访问音频设备驱动，将PCM码流传输到物理声卡。

4、根据权利要求1所述的方法，其特征在于，所述终端设备包括音频设备驱动、用户界面UI和物理声卡，

所述终端设备通过自身的音频设备驱动向 USB 声卡设备发送音频数据，包括：物理声卡由模拟音频信号得到 PCM 码流；UI 从物理声卡获取该 PCM 码流，并通过音频设备驱动的音频设备接口将 PCM 码流传输到音频设备驱动，音频设备驱动向 USB 声卡设备发送 PCM 码流。

5、一种实现无线数据终端通用串行总线音频传输的装置，其特征在于，该装置包括：无线数据终端、USB 声卡设备和终端设备，

无线数据终端，用于通过 USB 声卡设备向终端设备发送音频数据，通过 USB 声卡设备接收来自终端设备的音频数据。

USB 声卡设备，用于在无线数据终端和终端设备之间传输音频数据；

终端设备，用于通过自身的音频设备驱动访问 USB 声卡设备获取来自无线数据终端的音频数据，通过自身的音频设备驱动向 USB 声卡设备发送音频数据。

6、根据权利要求 5 所述的装置，其特征在于，所述 USB 声卡设备包括：无线数据终端侧 USB 驱动、无线数据终端 USB 端点和终端设备 USB 端点，

所述无线数据终端侧 USB 驱动与无线数据终端的基带处理模块相连；

所述无线数据终端 USB 端点通过 USB 数据线与终端设备 USB 端点相连；

所述终端设备 USB 端点与终端设备的音频设备驱动相连。

7、根据权利要求 6 所述的装置，其特征在于，所述终端设备包括音频设备驱动、用户界面 UI 和物理声卡，

音频设备驱动用于以访问 USB 声卡设备接口的方式访问所述终端设备 USB 端点，对传输到终端设备 USB 端点的 PCM 码流进行读取和释放；

UI 用于通过音频设备接口访问音频设备驱动，将 PCM 码流传输到物理声卡；

物理声卡用于由 PCM 码流得到模拟音频信号。

8、根据权利要求 6 所述的方法，其特征在于，所述终端设备包括音频设备驱动、用户界面 UI 和物理声卡，

物理声卡用于由模拟音频信号得到 PCM 码流；

UI 用于从物理声卡获取该 PCM 码流，并通过音频设备驱动的音频设备接口将 PCM 码流传输到音频设备驱动；

音频设备驱动用于向所述终端设备 USB 端点发送 PCM 码流。

实现无线数据终端通用串行总线音频传输的方法及装置

技术领域

本发明涉及音频数据传输技术，具体涉及一种实现无线数据终端通用串行总线音频传输的方法及装置。

背景技术

目前，时分同步的码分多址（TD-SCDMA，Time Division-Synchronous Code Division Multiple Access）技术作为中国提出的第三代移动通信标准已经日趋成熟，在 TD-SCDMA 技术支持下，从网络下载数据和向网络上传数据的速度都得到了极大的提高，而速度的提高又必然会促进用户对音频业务和视频业务需求的增加。

现有技术中，无线数据终端在处理音频数据时，对从空口接收到的模拟音频信号，直接送到相应的射频、编解码器等硬件设备进行解调、解码，最后由扬声器播放；对麦克采集的需要发送的模拟音频信号，在相应的编解码器、射频等硬件设备进行编码、调制后发送出去。这种处理音频数据的方式存在的缺陷在于，由于需要对音频数据进行编码和解码，无线数据终端就必须配有相应的编解码器，增加了硬件成本。

为克服上述音频数据处理方式存在的缺陷，目前比较流行的实现方法是通用串行总线音频传输（VOUSB，Voice Over USB），以广泛应用的 PC 作为终端设备对该方法的实现作简单说明。无线数据终端将解调后的音频数据通过 USB 接口传输到 PC 进行解码等处理；类似的，将在 PC 中完成编码等处理的音频数据通过 USB 接口传输到无线数据终端。这样无线数据终端在硬件上就不再需要编解码器，降低了硬件成本。而且，相比于无线数据终端，PC 具有更强的计算能力和更多的内存资源，因此对音频数据具有更强大的处理能力，能够进行更

加丰富的处理，如：可进行去噪、润饰、混音等处理。

图 1 为现有技术中 VOUSB 的实现方法示意图，无线数据终端的空中接口接收远端设备经无线通信网络发来的模拟音频信号，并传输到射频进行解调，之后，由基带处理模块对解调后的音频数据进行放大和数字滤波处理，得到脉冲编码调制（PCM，Pulse Code Modulation） 码流，再将 PCM 码流传输到无线数据终端侧 USB 驱动，由该无线数据终端侧 USB 驱动将 PCM 码流传输到无线数据终端的 USB 端点，最后，按照 USB 标准的批量传输方式，PCM 码流经无线数据终端的 USB 端点传输到终端设备的 USB 端点。这里，无线数据终端侧 USB 驱动的作用是从基带处理模块接收音频数据并传输到无线数据终端的 USB 端点，或从无线数据终端的 USB 端点读出音频数据并传输到基带处理模块。所述 USB 标准的批量传输方式的特点是支持在不确定的时间内进行大量的数据传输，能保证数据一定可以传输，但不保证传输的带宽和延时，因此数据传输的实时性不好；另外，对于以 USB 标准的批量传输方式传输的音频数据，终端设备没有标准驱动对其进行处理，若要对该音频数据进行处理，需要借助于用户界面（UI，User Interface）来实现，其实现过程如下：

对无线数据终端发送到终端设备的 USB 端点的 PCM 码流，终端设备侧 USB 驱动将其读出，并进一步由终端设备的 UI 从终端设备侧 USB 驱动读取并释放，之后，将 PCM 码流传输到物理声卡。物理声卡对传输来的 PCM 码流进行解码，再经 A/D 转换等处理得到模拟音频信号，最后将模拟音频信号送扬声器播放。所述物理声卡可以为 PCI 接口的声卡或 USB 声卡等。这里，终端设备侧 USB 驱动的作用是从终端设备 USB 端点读出音频数据传输到 UI，或从 UI 获取音频数据传输到终端设备的 USB 端点。

但目前基于 VOUSB 的实现方法中，对无线数据终端和终端设备之间的 USB 音频数据传输通道仅仅是作为数据的传输通道，这样带来的问题是没有针对音频数据传输的特点做专门的优化，在实时性等方面影响了 VOUSB 的实际应用效果。

发明内容

有鉴于此，本发明的主要目的在于提供一种实现无线数据终端通用串行总线音频传输的方法及装置，充分利用终端设备处理音频数据的强大能力，增强VOUSB的实际应用效果。

为达到上述目的，本发明的技术方案是这样实现的：

本发明公开了一种实现无线数据终端通用串行总线音频传输的方法，将无线数据终端和终端设备之间的USB音频数据传输通道枚举为USB声卡设备，关键是该方法包括以下步骤：

无线数据终端通过所述USB声卡设备向终端设备发送音频数据，终端设备通过自身的音频设备驱动访问所述USB声卡设备获取音频数据；终端设备通过自身的音频设备驱动向所述USB声卡设备发送音频数据，无线数据终端通过所述USB声卡设备接收该音频数据。

所述将无线数据终端和终端设备之间的USB音频数据传输通道枚举为USB声卡设备，包括：无线数据终端将传输音频数据的无线数据终端USB端点定义为声卡，并将该无线数据终端USB端点通过USB数据线连接到终端设备USB端点；终端设备向无线数据终端请求获取所连接声卡的设备描述符、配置描述符、描述符集合，无线数据终端收到请求后，向终端设备发送设备描述符、配置描述符、描述符集合；终端设备根据获取的设备描述符、配置描述符、描述符集合确定能够提供USB的驱动，加载相应符合USB规范的音频设备驱动，由音频设备驱动对声卡进行配置，得到USB声卡设备。

所述终端设备包括音频设备驱动、用户界面UI和物理声卡，其中，所述终端设备通过自身的音频设备驱动访问USB声卡设备获取音频数据，包括：音频设备驱动以访问USB声卡设备接口的方式访问所述USB声卡设备，对传输到USB声卡设备的脉冲编码调制PCM码流进行读取和释放；UI通过音频设备接口访问音频设备驱动，将PCM码流传输到物理声卡。

所述终端设备包括音频设备驱动、用户界面UI和物理声卡，其中，所述终

端设备通过自身的音频设备驱动向 USB 声卡设备发送音频数据，包括：物理声卡由模拟音频信号得到 PCM 码流；UI 从物理声卡获取该 PCM 码流，并通过音频设备驱动的音频设备接口将 PCM 码流传输到音频设备驱动，音频设备驱动向 USB 声卡设备发送 PCM 码流。

本发明还公开了一种实现无线数据终端通用串行总线音频传输的装置，该装置包括：无线数据终端、USB 声卡设备和终端设备，

无线数据终端，用于通过 USB 声卡设备向终端设备发送音频数据，通过 USB 声卡设备接收来自终端设备的音频数据。

USB 声卡设备，用于在无线数据终端和终端设备之间传输音频数据；

终端设备，用于通过自身的音频设备驱动访问 USB 声卡设备获取来自无线数据终端的音频数据，通过自身的音频设备驱动向 USB 声卡设备发送音频数据。

所述 USB 声卡设备包括：无线数据终端侧 USB 驱动、无线数据终端 USB 端点和终端设备 USB 端点，其中，所述无线数据终端侧 USB 驱动与无线数据终端的基带处理模块相连；所述无线数据终端 USB 端点通过 USB 数据线与终端设备 USB 端点相连；所述终端设备 USB 端点与终端设备的音频设备驱动相连。

所述终端设备包括音频设备驱动、用户界面 UI 和物理声卡，其中，音频设备驱动用于以访问 USB 声卡设备接口的方式访问所述终端设备 USB 端点，对传输到终端设备 USB 端点的 PCM 码流进行读取和释放；UI 用于通过音频设备接口访问音频设备驱动，将 PCM 码流传输到物理声卡；物理声卡用于由 PCM 码流得到模拟音频信号。

所述终端设备包括音频设备驱动、用户界面 UI 和物理声卡，其中，物理声卡用于由模拟音频信号得到 PCM 码流；UI 用于从物理声卡获取该 PCM 码流，并通过音频设备驱动的音频设备接口将 PCM 码流传输到音频设备驱动；音频设备驱动用于向所述终端设备 USB 端点发送 PCM 码流。

由此可见，相比现有技术而言，本发明所提供的一种实现无线数据终端通

用串行总线音频传输的方法及装置具有下述特点和优点：

首先，将无线数据终端和终端设备之间的 USB 音频数据传输通道，采用 USB 规范定义的标准的 USB AUDIO CLASS 枚举成一个 USB 声卡设备来传输音频数据，而广泛使用的终端设备上的操作系统都默认的提供了符合 USB 规范的音频设备驱动的实现，因此，音频设备驱动以访问 USB 声卡设备接口的方式访问终端设备的 USB 端点；音频设备驱动对从 USB 端点读取的音频数据进行读取和释放。

其次，采用 USB 标准的同步传输方式传输音频数据具有好的实时性，且终端设备具有针对该同步传输方式的标准驱动，即音频设备驱动，对终端设备 USB 端点的音频数据的读取和释放都是在音频设备驱动中完成，其处理优先级高于在应用程序 UI 中处理，因此，在终端设备系统负载很重的时候，音频数据的处理依然有很好的实时性。

最后，UI 通过音频设备接口来访问音频设备驱动，将完成释放的音频数据传输到物理声卡。由于 UI 是通过音频设备接口来访问音频设备驱动，减少了 UI 对音频设备驱动的依赖；音频设备接口是标准接口，不用关注底层音频设备驱动实现的细节，且操作系统可移植性好，让 UI 实现起来更加简单、可靠。

针对音频数据传输的特点，对 USB 音频数据传输通道进行抽象和优化，充分利用终端设备处理音频数据的强大能力，增强 VOUSB 的实际应用效果。

附图说明

图 1 为现有技术中 VOUSB 的实现方法示意图；

图 2 为本发明中将 USB 音频数据传输通道抽象成 USB 声卡设备的示意图；

图 3 为本发明中无线数据终端作为音频数据接收方的传输流程图；

图 4 为本发明中无线数据终端作为音频数据发送方的传输流程图；

图 5 为本发明中实现无线数据终端通用串行总线音频传输的装置结构示意图。

具体实施方式

下面结合附图及具体实施例对本发明再作进一步详细的说明。

图 2 为本发明中将 USB 音频数据传输通道抽象成 USB 声卡设备的示意图。对比图 1，本发明中，借用 USB 规范中 USB 声卡应用方法将无线数据终端与终端设备之间的 USB 音频数据传输通道抽象成一个 USB 声卡设备。所述 USB 音频数据传输通道指：无线数据终端侧 USB 驱动、无线数据终端的 USB 端点、终端设备的 USB 端点、以及两个 USB 端点之间的 USB 数据线在内的音频数据传输通道。实现 USB 音频数据传输通道抽象成一个 USB 声卡设备的关键在于，将 USB 音频数据传输通道，采用 USB 规范定义的标准的 USB AUDIO CLASS 枚举成一个 USB 声卡设备。所述枚举通过以下步骤来实现：首先，无线数据终端侧将传输音频数据的无线数据终端 USB 端点定义为一个声卡，并将该无线数据终端 USB 端点通过 USB 数据线连接到终端设备 USB 端点；之后，终端设备向无线数据终端发送请求，请求获取所连接声卡的设备描述符、配置描述符、描述符集合等信息；无线数据终端在收到请求后，向终端设备发送所请求的设备描述符、配置描述符、描述符集合等信息；然后，终端设备在获取这些信息并根据这些信息确定能够提供 USB 的驱动以后，加载相应符合 USB 规范的音频设备驱动；最后，终端设备在得到各种描述符之后，认为所连接的声卡的信息已经齐全，便由音频设备驱动对声卡进行配置，配置成功即可实现无线数据终端与终端设备之间的音频数据传输。至此，枚举过程结束，实现了将 USB 音频数据传输通道枚举成 USB 声卡设备。无线数据终端与 USB 声卡设备的无线数据终端侧 USB 驱动相连接；终端设备与 USB 声卡设备的终端设备 USB 端点相连接。

不同于通常的 USB 声卡等物理声卡所具有的音频数据处理能力，且可将处理后的音频数据直接送到扬声器播放，该 USB 声卡设备的特点是具有和物理声卡一样的访问接口和使用方法，对用户来说就好像是一个实际的物理声卡，但实际上，这个 USB 声卡设备只具有音频数据传输功能，而没有真实的音频数

据处理能力，如果还要对收到的音频数据进行处理，就需要借助于终端设备上的物理声卡来实现。对于终端设备发送到无线数据终端的音频数据，无线数据终端将通过无线通信网络传输到远端设备。所述远端设备可以为无线数据终端或终端设备。如果远端设备还要对收到的音频数据进行处理，对于远端设备是终端设备的情况，直接借助该终端设备上的物理声卡处理音频数据后播放；对于远端设备是无线数据终端的情况，将接收到的音频数据传输到和该无线数据终端通过 USB 声卡设备相连的终端设备，借助于该终端设备上的物理声卡处理音频数据后播放。

由于将无线数据终端和终端设备之间的 USB 音频数据传输通道，采用 USB 规范定义的标准的 USB AUDIO CLASS 枚举成一个 USB 声卡设备，实现音频数据传输，而广泛使用的终端设备上的操作系统都默认的提供了符合 USB 规范的音频设备驱动的实现，因此，对于由无线数据终端发送到 USB 声卡设备的终端设备 USB 端点的音频数据，音频设备驱动以访问 USB 声卡设备接口的方式访问该终端设备 USB 端点；音频设备驱动在访问终端设备 USB 端点时，对发送到该终端设备 USB 端点的音频数据进行读取和释放，相比于现有的由应用程序 UI 读取和释放音频数据，由音频设备驱动进行读取和释放优先级更高，因此，即使在终端设备系统负载很重的时候，音频数据的处理依然具有很好的实时性；音频设备驱动除了向下访问终端设备 USB 端点，向上还可提供音频设备接口，该音频设备接口是标准接口，UI 访问该音频设备接口时，不用关注低层的音频设备驱动实现的细节，且操作系统可移植性好，UI 可通过音频设备接口访问音频设备驱动并将音频数据传送到物理声卡，减少了 UI 对音频设备驱动的依赖，使 UI 实现起来更加简单、可靠。

具体的，利用 USB 声卡设备实现音频数据传输的过程如图 3、图 4 所示。

图 3 为无线数据终端作为音频数据接收方的传输流程图，音频数据的传输包括以下步骤：

步骤 301：无线数据终端的空中接口接收远端设备经无线通信网络发来的模拟音频信号，并传送到射频等硬件进行解调，之后，由基带处理模块对解调

后的音频数据进行放大和数字滤波处理，得到 PCM 码流。

步骤 302：处理后得到的 PCM 码流由无线数据终端的基带处理模块传输到 USB 声卡设备的无线数据终端侧 USB 驱动；之后，按照 USB 标准的同步传输方式，PCM 码流经无线数据终端 USB 端点和 USB 数据线被传输到 USB 声卡设备的终端设备 USB 端点。

步骤 303：在 PCM 码流传输到终端设备 USB 端点之后，终端设备的音频设备驱动以访问 USB 声卡设备接口的方式访问该终端设备 USB 端点，并对传输到终端设备 USB 端点的 PCM 码流进行读取和释放，之后，UI 通过音频设备接口访问音频设备驱动，将 PCM 码流传输到物理声卡。

步骤 304：物理声卡对传送来的 PCM 码流进行解码、D/A 转换等处理后得到模拟音频信号，最后，将该模拟音频信号传输到扬声器播放。

图 4 为无线数据终端作为音频数据发送方的传输流程图，音频数据的传输包括以下步骤：

步骤 401：终端设备的麦克将采集的模拟音频信号传送到物理声卡，由物理声卡对其进行 A/D 转换、编码等处理，得到 PCM 码流形式的数字音频信号。

步骤 402：终端设备的 UI 从物理声卡获取 PCM 码流，并通过音频设备驱动的音频设备接口将 PCM 码流传输到音频设备驱动，由音频设备驱动对 PCM 码流进行压缩，之后，音频设备驱动以访问 USB 声卡设备接口的方式将 PCM 码流回传到 USB 声卡设备的终端设备 USB 端点。

步骤 403：在 PCM 码流传输到 USB 声卡设备的终端设备 USB 端点之后，按照 USB 标准的同步传输方式，PCM 码流经 USB 数据线传输到 USB 声卡设备的无线数据终端 USB 端点。

步骤 404：无线数据终端的基带处理模块通过无线数据终端侧 USB 驱动获取传输到无线数据终端 USB 端点的 PCM 码流，进行放大和数字滤波处理，再经射频进行调制，得到模拟音频信号，最后，由空中接口经无线通信网络发送到远端设备。

为实现上述方法，本发明还提供一种实现无线数据终端通用串行总线音频

传输的装置，如图 5 所示，该装置主要由无线数据终端、USB 声卡设备、以及终端设备组成。

其中，无线数据终端，用于通过 USB 声卡设备向终端设备发送音频数据；通过 USB 声卡设备接收来自终端设备的音频数据。

USB 声卡设备，用于在无线数据终端和终端设备之间传输音频数据。

终端设备，用于通过自身的音频设备驱动访问 USB 声卡设备获取来自无线数据终端的音频数据，通过自身的音频设备驱动向 USB 声卡设备发送音频数据。

具体的，终端设备的音频设备驱动以访问 USB 声卡设备接口的方式访问终端设备 USB 端点，对传输到该终端设备 USB 端点的音频数据进行读取和释放，之后，进一步由 UI 将音频数据传输到物理声卡进行解码、D/A 转换，最后由扬声器播放；对麦克采集，并进一步由物理声卡进行 A/D 转换、编码的音频数据，由 UI 传输到音频设备驱动进行压缩，之后，由音频设备驱动以访问 USB 声卡设备接口的方式回传到终端设备 USB 端点。

以上所述，仅为本发明的较佳实施例而已，并非用于限定本发明的保护范围。

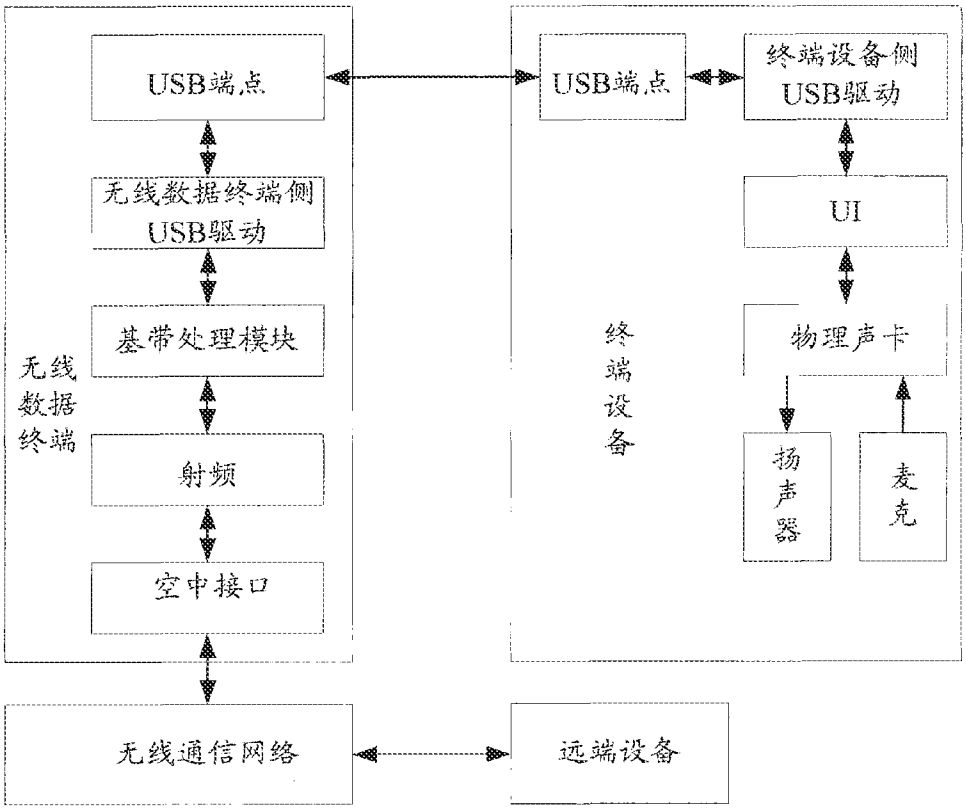

USB端点
无线数据终端侧USB驱动
基带处理模块
射频
空中接口
无线数据终端
USB端点
终端设备侧USB驱动
UI
物理声卡
扬声器
麦克
终端设备
无线通信网络
远端设备

图 1

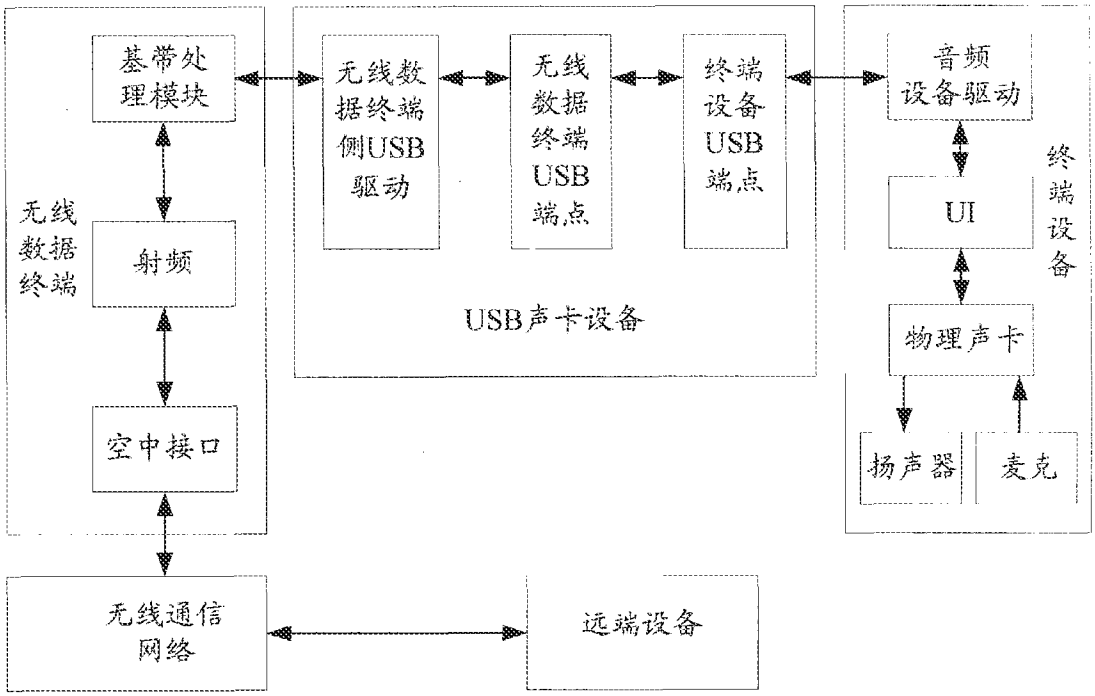

基带处理模块
射频
空中接口
无线数据终端
无线数据终端侧USB驱动
无线数据终端USB端点
终端设备USB端点
USB声卡设备
音频设备驱动
UI
物理声卡
扬声器
麦克
终端设备
无线通信网络
远端设备

图 2

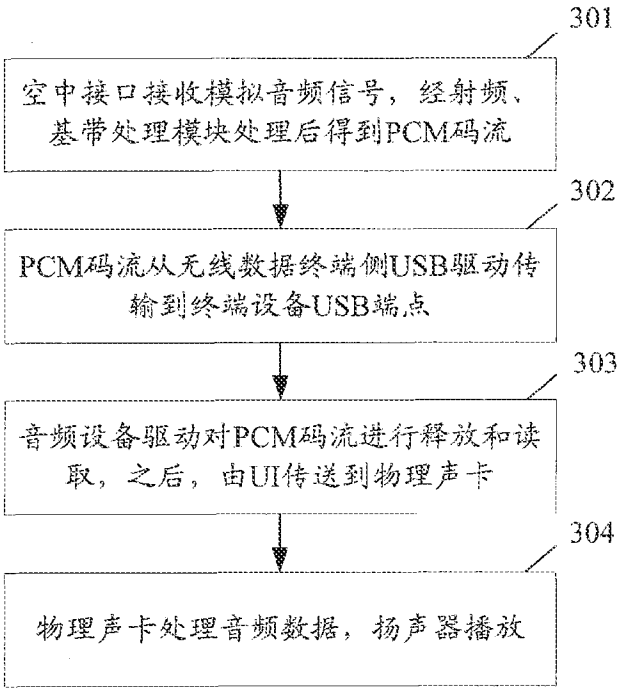

301
空中接口接收模拟音频信号，经射频、基带处理模块处理后得到PCM码流
302
PCM码流从无线数据终端侧USB驱动传输到终端设备USB端点
303
音频设备驱动对PCM码流进行释放和读取，之后，由UI传送到物理声卡
304
物理声卡处理音频数据，扬声器播放

图 3

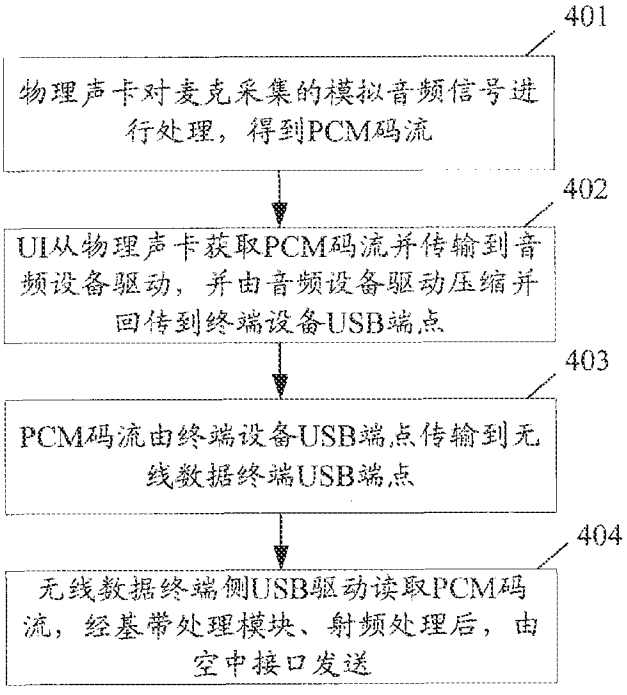

401
物理声卡对麦克采集的模拟音频信号进行处理，得到PCM码流
402
UI从物理声卡获取PCM码流并传输到音频设备驱动，并由音频设备驱动压缩并回传到终端设备USB端点
403
PCM码流由终端设备USB端点传输到无线数据终端USB端点
404
无线数据终端侧USB驱动读取PCM码流，经基带处理模块、射频处理后，由空中接口发送

图 4

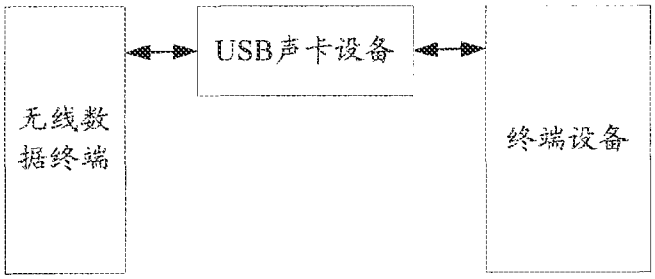


图 5

PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
Stylesheet Version v1.2

EPAS ID: PAT6463312

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	ASSIGNMENT

CONVEYING PARTY DATA

Name	Execution Date
KOEN SIMON HERMAN BEEL	01/30/2015
YOAV NIR	02/23/2015
FILIP JOSEPHINE JOHAN LOUWET	01/30/2015
GUY COEN	01/30/2015

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State/Country:	BELGIUM
Postal Code:	B-8500

PROPERTY NUMBERS Total: 1

Property Type	Number
Application Number:	17121919

CORRESPONDENCE DATA

Fax Number: (703)683-1080

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Address Line 1: 625 SLATERS LANE
Address Line 2: 4TH FLOOR
Address Line 4: ALEXANDRIA, VIRGINIA 22314

ATTORNEY DOCKET NUMBER:	BEEL3002CIPC2/TL
NAME OF SUBMITTER:	THOMAS LEE
SIGNATURE:	/Thomas Lee/
DATE SIGNED:	12/22/2020
	This document serves as an Oath/Declaration (37 CFR 1.63).

Total Attachments: 3

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source=BEEL3002CIP_Dec_Assign#page3.tif

Attorney Docket No.: BEEL3002CIP/TJM/TL

DECLARATION & ASSIGNMENT
(WITH APPLICATION DATA SHEET ONLY)

DECLARATION

TITLE OF INVENTION: **ELECTRONIC TOOL AND METHODS FOR MEETINGS**

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The accompanying utility or design patent application, or

☒ United States application number: 14/212,170 filed on March 14, 2014.

1. The above-identified application was made or authorized to be made by me.

2. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

3. I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

Direct all correspondence to the address associated with **Customer Number: 23364**.

By signing this declaration, the inventor confirms that the application, including the claims, has been read and understood and that the inventor is aware of the duty to disclose to the U.S. Patent and Trademark Office all information known to the inventor to be material to patentability as defined in 37 CFR§1.56.

ASSIGNMENT

WHEREAS, I, the below named inventor, hereinafter referred to as ASSIGNOR, is the or an owner of certain new and useful improvements in the above identified application (hereinafter referred to as the INVENTION).

WHEREAS, BARCO N.V., whose post office address is/are Pres. Kennedypark 35, Kortrijk, Belgium B-8500,

hereinafter referred to as ASSIGNEE, is desirous of acquiring the entire right, title and interest in and to the INVENTION in the United States;

NOW, THEREFORE, for good and valuable consideration, receipt of which is hereby acknowledged, I, ASSIGNOR, by these presents do sell, assign and transfer unto said ASSIGNEE, the entire right, title, and interest in and to said INVENTION and application throughout the United States of America, including any and all Letters Patent granted on any division, continuation, continuation-in-part and reissue of said application.

ALSO, ASSIGNOR hereby agrees to execute any documents that legally may be required in connection with the filing, prosecution and maintenance of said application or any other patent application(s) in the United States for said INVENTION, including additional documents that may be required to affirm the rights of ASSIGNEE in and to said INVENTION, all without further consideration. ASSIGNOR also agrees, without further consideration and at ASSIGNEE'S expense, to identify and communicate to ASSIGNEE at ASSIGNEE'S request documents and information concerning the INVENTION that are within ASSIGNOR'S possession or control, and to provide further assurances and testimony on behalf of ASSIGNEE that lawfully may be required of ASSIGNOR in respect of the prosecution, maintenance and defense of any patent application or patent encompassed within the terms of this instrument. ASSIGNOR'S obligations under this instrument shall extend to ASSIGNOR'S heirs, executors, administrators and other legal representatives.

ALSO, ASSIGNOR hereby authorizes and requests the Commissioner of Patents and Trademarks to issue any and all Letters Patent referred to above to ASSIGNEE, as the ASSIGNEE of the entire right, title and interest in and to the same, for ASSIGNEE'S sole use and behoof; and for the use and behoof of ASSIGNEE'S legal representatives and successors, to the full end of the term for which such Letters Patent may be granted, as fully and entirely as the same would have been held by ASSIGNOR had this assignment and sale not been made.

ASSIGNOR authorizes any member of the firm of *Bacon & Thomas, PLLC* to insert or complete any information in the assignment portion of this document needed to effect its recordal in the U.S. Patent and Trademark Office.

LEGAL NAME OF INVENTOR/ASSIGNOR			
Name:	Koen Simon Herman BEEL	Date:	X 30/01/2015
Signature:	X		

LEGAL NAME OF INVENTOR/ASSIGNOR			
Name:	Yoav NIR	Date:	X 23/02/2015
Signature:	X		

LEGAL NAME OF INVENTOR/ASSIGNOR			
Name:	Filip Josephine Johan LOUWET	Date:	X 30/11/15
Signature:	X LOUWET		

LEGAL NAME OF INVENTOR/ASSIGNOR			
Name:	Guy COEN	Date:	X 30/11/15
Signature:	X		

GENERAL POWER OF ATTORNEY BY APPLICANT

This power revokes any previous powers of attorney given in the above-identified patent application.

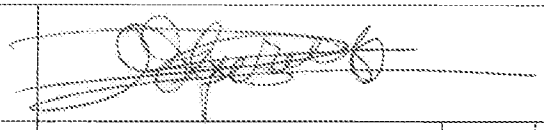
I (we) hereby appoint Practioners associated with the following Customer Number as my/our attorney, and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A or equivalent):

Customer Number: 23364

Please recognize or change the correspondence address for the above-identified application to the address associated with the above-mentioned Customer Number.

I (we) am/are the Applicant Assignee or Person to Whom the Inventor is Under an Obligation to Assign. This revocation and appointment to the above-identified Practitioners is to the exclusion of the inventor(s).

Signature of Applicant for Patent

Signature			
Name	PETER GERETS	Date	13/02/2017.
Title and Company	BARCO NV, VP Technology		

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(WITH APPLICATION DATA SHEET ONLY)

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WHEREAS, BARCO N.V., whose post office address is/are Pres. Kennedypark 35, Kortrijk, Belgium B-8500,

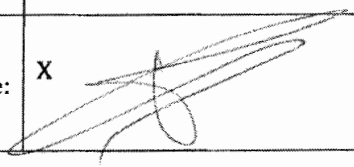
hereinafter referred to as ASSIGNEE, is desirous of acquiring the entire right, title and interest in and to the INVENTION in the United States;

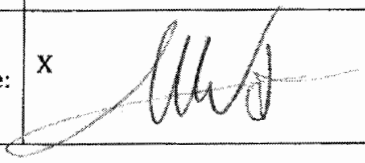
NOW, THEREFORE, for good and valuable consideration, receipt of which is hereby acknowledged, I, ASSIGNOR, by these presents do sell, assign and transfer unto said ASSIGNEE, the entire right, title, and interest in and to said INVENTION and application throughout the United States of America, including any and all Letters Patent granted on any division, continuation, continuation-in-part and reissue of said application.

ALSO, ASSIGNOR hereby agrees to execute any documents that legally may be required in connection with the filing, prosecution and maintenance of said application or any other patent application(s) in the United States for said INVENTION, including additional documents that may be required to affirm the rights of ASSIGNEE in and to said INVENTION, all without further consideration. ASSIGNOR also agrees, without further consideration and at ASSIGNEE'S expense, to identify and communicate to ASSIGNEE at ASSIGNEE'S request documents and information concerning the INVENTION that are within ASSIGNOR'S possession or control, and to provide further assurances and testimony on behalf of ASSIGNEE that lawfully may be required of ASSIGNOR in respect of the prosecution, maintenance and defense of any patent application or patent encompassed within the terms of this instrument. ASSIGNOR'S obligations under this instrument shall extend to ASSIGNOR'S heirs, executors, administrators and other legal representatives.

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ELECTRONIC TOOL AND METHODS FOR MEETINGS

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. application 14/725,401, filed May 29, 2015, which is a continuation of U.S. application 14/212,170, filed March 14, 2014, granted as U.S. Patent 9,083,769, which is a continuation-in-part of U.S. application 13/270,659, filed October 11, 2011, granted as U.S. Patent 8,756,348, which claims the benefit of U.S. provisional application 61/534,592, filed September 14, 2011, and which is a continuation-in-part of International Application PCT/EP2012/068166, filed September 14, 2012, which claims the benefit of U.S. provisional application 61/534,592, filed September 14, 2011, U.S. provisional application 61/635,219, filed April 18, 2012, and U.S. application 13/270,659, filed October 11, 2011, which are all incorporated by reference.

The present invention relates to electronic tools for meetings including methods or devices for providing connection to a communications network, to networks or methods of operating the network, methods or devices for use in displaying media content as well as software for performing any of these methods.

Background

Tools for collaboration

Allowing ad hoc groups of persons to communicate with each other is one of the fundamental aspects of collaboration, problem solving, negotiation, teaching and education, etc. To assist in communication, there has been an explosion of electronic communication tools such as electronic conferencing tools, e.g. synchronous and asynchronous conferencing, online chat, Instant Messaging, audio conferencing, videoconferencing, data conferencing, application sharing, remote desktop sharing, electronic meeting systems,

collaborative management (coordination) tools, project management systems, knowledge management systems, and social software systems.

One classic approach is the lecture or seminar often involving a presentation using presentation software. To a large extent the traditional single person presentation or lecture has been maintained with the audience being in a rather passive mode as far as determining, constructing, augmenting or modifying the information to be presented is concerned.

As with other business processes, meetings are going digital. Increasingly, people are using computer technology alone and in conjunction with broadband networks to support their meeting objectives prior to and during an actual meeting. For example, e- mail is used to pass around files for people to read prior to a meeting.

Collaborative workspaces in corporate networks and on the Internet offer geographically distributed collaborators a virtual repository for documents related to a project or a meeting. Electronic meeting support systems, such as interactive network-connected white boards and videoconferencing appliances, are available for the benefit of those who share the same room as well as those who are in remote locations.

The AMIDA Final Public Report describes the overall methodology behind the development of meeting support technologies. It reports that numerous studies confirm that meetings dominate the way people work. Namely, according to a study conducted by MCI Worldcom in 2003 a business person participates in 60 meetings per month. People meet in groups for a multitude of reasons. They interact in numerous predictable and unpredictable ways and the results of their interactions are as varied as the people who participate and the projects on which they are collaborating or communicating. Studies of business processes also reveal that approximately 80% of the "workload" associated with a project or process happens in preparation for a meeting. In other words, many people view the "live" meeting as a milestone or deadline by which they can pace and measure their productivity and that of their colleagues. Unfortunately, for many

information managers, being in perpetual meetings has reduced their ability to prepare adequately for the next meeting, perpetuating a vicious and negative cycle.

However, Marc Al-Hames et al. report in "Audio-Visual Processing in Meetings: Seven Questions and Current AMI Answers", that although large parts of working days are consumed by meetings and conferences, unfortunately a lot of them are neither efficient, nor especially successful. They report a study in which people were asked to select emotion terms that they thought would be frequently experienced in a meeting. The top answer - mentioned from more than two third of the participants - was "boring"; furthermore nearly one third mentioned "annoyed" as a frequently perceived emotion.

The conclusion is that despite the plethora of electronic aids to meetings, fundamental problems in handling meetings have not been solved. In fact organising and conducting meetings in a business context involves a large number of factors.

Participation

A lack of efficiency of meetings is addressed in the article "Mood indicators on electronic meeting tools" IBM, IP.com number: IPCOMOOOOl 171 ID, Publication Date: March 12, 2003. This article addresses the issue that the lack of direct feedback makes meetings clumsy, inefficient and often unproductive. It proposes a "mood indicator" as well as an "I want to ask a question" indicator which allow the presenter to choose an appropriate moment to pause, change track or field a question. It is argued that interrupting a presenter in full flow can be awkward; however, sometimes it is difficult to get an opportunity to ask a question or make a comment when many different people are trying to make their voices heard. In a similar vein, US6966035 suggests displaying a "murmur frame" for a participant to express a view. To increase user participation, US 2010/0087139 discloses a system for sending a selection to another computer, and US 2006/0095376 discloses a system for secure voting.

Commenting, voting or selecting requires that a central authority provides the information that is to be selected or commented or voted on. Hence, these proposals still leave a central figure such as the presenter in a dominating position and the other members of the meeting are largely an audience with limited selection or voting or participation rights.

A further problem with meetings is that someone is usually late or has to leave early. With the person arriving late one has to decide if the meeting is interrupted and a summary of the proceedings so far is given. For the person leaving early (often a senior person), subsequent discussions can go missing. If there is a notes taker, this provides a personal summary of the meeting - but not an objective one.

Presents systems do not provide an optimal solution.

Legal and security issues

A legal requirement of a meeting is that presentations, comments and submissions need to be completely reproducible - in some circumstances, e.g. in a share holders' meeting, the events in the meeting should be subject to total recall. Computer- supported collaborative work technologies, particularly those which capture human verbal and non-verbal communications (audio and video interaction) in addition to text and graphics generated during a meeting, promise to have a long term impact on how people will prepare for and behave during and following meetings. In addition, connecting to a network brings the danger of virus, malware or spyware transfer in either direction, and there is danger of copying of confidential information.

Practical Difficulties

Scalability and ease of use

There are even more fundamental problems with using electronic tools in meetings. If two persons want to make two presentations then usually either both presentations must be placed on one machine or there is a need to swap between the presenters' machines. To bring the display content of a computer to a projector, the most common ways are to use a cable that connects the display adapter of the graphics card to the video input of the projector [method

1] or to use a software that captures the display contents and sends it over a wired or wireless network to a remote base unit connected to the projector [method 2]. This is often called "remote desktop" and is mostly used for remote administration or remote IT assistance purposes.

Less common but also practiced methods are to use a special device connected to the display adapter of the graphics card, that captures, encodes and streams the display content over a wired or wireless network [method 3].

Method 1 has several practical problems and disadvantages. In meetings where people want to contribute content from their own computers, e.g. to project images on a display, typically a video cable such as a VGA cable is used to connect each PC one at a time to the projector. This is not only not scalable but also can be and often is quite a cumbersome process that typically wastes valuable meeting time and takes the dynamism out of the meeting. Connection can be made more difficult and time consuming for example if the computer has to be rebooted for it to detect the projector or when the format of the PC differs from the format of the projector. In addition changing format can leave the computer with a new format that is not compatible with its own screen so that on reboot of the PC alone, nothing is displayed on the computer screen. Without a visible screen image the necessary re-configuration can be difficult.

These issues are aggravated by a number of elements:

- The use of many different video adapters, such as VGA, DVI-A, DVI-D, DVI- I, DP, HDMI, thunderbolt,...
- Reach depends on cable length: too long leaves a tangled cable "salad" in the meeting room, too short reduces flexibility, often necessitating people to move around in the meeting room when they want to present something.

- Cable connection is either point to point or requires tedious and extensive cabling and the use of complex and expensive video switches.

- It is often difficult and time consuming to find the right display resolution and refresh rate that both the computer and the display or

projector support.

Known technical solutions are expensive and not 100% reliable. Method 2 also has many drawbacks. If the connection is made to a corporate LAN there is a danger of virus, malware or spyware transfer in either direction, there is danger of copying of confidential information, and there is the difficulty of making the connection, e.g. entry of a user code and password, as well the administration of such passwords and user codes. In business contexts, visitors to meeting rooms typically do find technical difficulty with such means to connect to a central projector or display in the meeting room.

Additional problems can occur with firewalls and proxies. Typically a visitor to a meeting will bring a computer such as a laptop that is set up for a different corporate networking environment and hence has different or incompatible networking settings. The setting up of a firewall can be complicated and if this is not done correctly, telecommunication software that has to pass through a firewall may be blocked. In order to solve problems associated with firewalls it may be necessary to open ports or identify or even add programs in an exception list. If, besides a network (hardware) firewall and an operating system firewall, there is any software based third-party firewall like Zonealarm, CA Internet Security Suite or McAfee Firewall, then it is necessary to follow that software developer's documentation to place programs on a safe list or adding exceptions to the firewall rules. Such activity is beyond the usual user. Fussing with computer settings, or having to call for IT support wastes valuable meeting time and takes the dynamism out of the meeting.

The advantage of method 3 is that the computer does not need to use its own processing power to bring the display content in a form that is easily transported over a network. This advantage becomes less relevant as computers grow in processing power. A drawback of method 3 is that the same problems often encountered with method 1 of connecting to the display adapter remain. Another drawback is that the special device referred to requires significant processing power, which means that this device will consume much

power and will require a separate power supply, be relatively big and certainly be relatively expensive.

An alternative method in the making today is to use the well-known USB interface of the computer for extracting the display content of the computer. US 2009/0198839 discloses such a pluggable cable arrangement. US 2011/0115689 discloses a similar USB solution for wireless connection to a projector. Accordingly connecting a projector to a computer using the standard USB port might become commonplace with time. However, this usually requires special drivers and even special hardware in the computer. Connecting a projector to a computer using the standard USB port hence might become commonplace - but even when that happens there will be a mix of new and legacy machines for several years.

Conclusion

The following problems remain for holding a face-to-face meeting using advanced electronic tools at the present time:

- Complexity of the networking infrastructure.
- High demands on technical expertise of users in current systems that are supposed to be designed to support everyday use by the non-expert user.
- Barriers to the use of complicated technology in meetings.
- Great variety of possible collaborative software solutions - none of which seems to solve the fundamental problems of holding successful meetings.
- Meetings being boring or annoying for members of the meeting.
- Complexity of firewalls and other security measures employed in corporate networks.
- Lack of, or restriction of participation by members of a meeting.
- Time taken to prepare presentations for meetings.
- Need to record events in the proper time sequence at meetings without burdening a meeting more than necessary.

Although some tools solve some of these problems effectively, no electronic meeting tool solves all of them.

Summary of the invention

An object of the present invention is to provide network solutions including electronic tools for meetings as well as devices for providing connection to a communications network, to methods of operating the network, methods of displaying media content as well as software for performing any of these methods or for implementing such systems. There is also a need to capture what is actually shown or said in a meeting and not merely what might have been shown or said.

An aspect the present invention provides an electronic meeting tool for communicating arbitrary media content from users at a meeting comprising: a node configuration means adapted to operate a display node of a communications network, the display node being coupled to a first display, the node configuration means being adapted to receive user selected arbitrary media content and to control display of the user selected arbitrary media content on the first display; and at least one peripheral device adapted to communicate the user selected arbitrary media content via the communications network, wherein the peripheral device is a connection unit comprising:

(a) a connector adapted to couple to a port of a processing device having a second display, a memory and an operating system; and

(b) a transmitter for communicating with the communications network, a program adapted to be loaded onto the processing device and to run on the operating system of the processing device, said program being adapted to obtain user selected arbitrary media content, said program leaving a zero footprint on termination, and an input device to allow the user to carry out a user action that triggers transfer of said user selected arbitrary media content to said transmitter through said port.

Obtaining user selected arbitrary media content is preferably not obtained by application sharing but by the process of screen scrapping. Although software

packages that provide screen scraping require installation on the target device, or at least require the installation of dedicated and/or custom drivers, embodiments of the present invention use software stored on the peripheral device which allows screen scraping when run on the processing device but leaves a zero footprint when terminated. Embodiments of the present invention can screen scrape full HD videos at 20fps without requiring any installation of a program on the processing device nor requiring configuring the processing device such as a PC that they run on for the connectivity to the network hence meeting "zero footprint" requirements.

The program adapted to be loaded onto the processing device and to run on the operating system of the processing device and being adapted to obtain user selected arbitrary media content can be stored on the peripheral device. The transmitter can be a wireless transmitter or transceiver. The peripheral device can be a plug-and-play device. The program can be adapted to screen scrape content of the second display.

The input device can be physical actuator coupled to the peripheral device. The physical actuator preferably has a surface area of between 100 and 14,400 square mm. Alternatively, the input device can be a key displayed on the second display. The key displayed on the second display can be one not screen scraped by the program.

On the peripheral device a mass storage device is provided that stores the software to be run on the processing device. The mass storage device can be logically closed once the software has been read and loaded and is running from RAM in the processing device. Also provided on the peripheral device is a further device such as an HID (human interface device) to capture user input and provide user feedback. In embodiments of the present invention, the peripheral device contains multiple internal logical devices that are combined:
- An HID (human interface device) used for capturing user input (e.g. following a user action such as pressing or activating a button) and providing user feedback, e.g. by an optical indicator such as a light ring around the button e.g.

an LED ring, for streaming the screen scraped video content to the network and hence to a base unit and a display,

- A mass storage device used to store the application,
- An audio device that acts as a virtual sound card to a client PC over USB, using a generic driver such as a UAC1 or UAC2 device driver.

Embodiments of the present invention are not limited to application sharing but make use of screen scraping which is able to capture all material in a neutral manner rather than being limited by proprietary applications. Further the screen scraper application is zero footprint on termination rather than being fully installed on the processing device. Embodiments of the present invention can provide arbitrary "full content" to the meeting room and participants can display in real-time,

The real-time content is shown on a central display rather than being broadcast to individual participants or archived.

Embodiments of the present invention "auto compose" arbitrary user data on a central display or screen so that full real-time content that is provided by multiple meeting participants who intentionally share this content in order to make the meeting more effective and efficient,

Embodiments of the present invention implement a principle of "democratic screen sharing", in which the meeting participants decide themselves on a peer-to-peer basis which content to share when and where. In particular in some embodiments a participant can obtain unilateral access to the display device, i.e. without agreement of other participants. Peer-to-peer data sharing differs from systems in which the content to be displayed is determined by a presenter or meeting director. The user determines where his content is routed to, and can do so without any software configuration on the user processing device.

Another aspect the present invention provides a method for connecting a processing device to a communications network, the processing device having a memory, a display and an operating system with at least one pre-installed generic driver providing a generic communications protocol for communication between processing device and a standard class of peripheral devices, the method comprising the steps of:

a) coupling a peripheral device to the processing device, the peripheral device having a transceiver;

b) setting up, by means of the pre-installed generic driver of the operating system, a means for communication between the peripheral device and the processing device; c) coupling the processing device to a communications network via the peripheral device;

d) routing screen scraped data between the processing device and the communication network via the means for communication, wherein the generic communication protocol is used for transferring the screen scraped data between the processing device and the peripheral device.

The routing of the screen scraped data can be to a defined network node such as a display node without user entry of configuration details. Thus the routing can be dedicated to a specific network node such as a display node, base station etc. This is achieved by pairing of the peripheral device to the relevant node before the communication starts.

In accordance with embodiments of the present invention users start an application from the peripheral device such as a USB dongle, thus making the connection in a 3 step process: (1) connect, e.g. plug in the peripheral device to the processing device, (2) start the screen scraping application, (3) perform a user action such as click on a button on the peripheral device to go allow content to be displayed on the central screen or display. To achieve step 2 Autorun or AutoPlay can be used with some Windows operating systems, but there are many different variants based on the OS version and which patches have been installed. Furthermore, this mechanism is generally considered a security hazard, which is why most IT departments will disable

Autorun/Autoplay. Other OS providers have disabled this function, e.g. Apple removed a similar functionality entirely from its OS/X since Snow Leopard. In an embodiment of the present invention a very small service - also called daemon on some OS's - is provided that requires installation on the processing device such as a laptop. This service is pre-installed on the processing device. The installation is required only once on every processing device such as a laptop. The role of this is to provide a permanently running service that continuously monitors if a peripheral device according to the present invention has been offered up for connection to the processing device. When such a peripheral device is connected, the service will detect this and start the client application software residing in the mass storage area of the peripheral device. Once the service is installed, connectivity with the peripheral device becomes a 2 step process: connect, e.g. plug in the peripheral device to the processing device, and (2) perform a user action such as click on a button on the peripheral device to allow content to be displayed on the central screen or display. The application loaded from the processing device still leaves a zero footprint on termination

Step b) can comprise presenting the peripheral device to the processing device as a human interface device and wherein the pre-installed generic driver is a human interface device driver. Alternatively or additionally step b) can comprise presenting the peripheral device to the processing device as a mass storage device and wherein the pre-installed generic driver is a mass storage device driver.

Alternatively, or additionally step b) comprises presenting the peripheral device to the processing device as a composite device and wherein pre-installed generic drivers drive different device interfaces independently.
A client application can be stored on the peripheral device which when run on the processing device obtains the screen scraped data. Such a client application can be a portable application and can leave a zero footprint on termination.

In another aspect the present invention provides a peripheral device for providing communication connectivity to a processing device which is provided with memory, a display and an operating system with at least one pre-installed generic driver providing a generic communication protocol for communication between the processing device and a standard class of peripheral devices, the peripheral device comprising a memory in which executable software code is stored for execution on the processing device, said executable software code comprising: a first software code portion for setting up, by means of the pre-installed generic driver of the operating system, a means for communication between the peripheral device and the processing device;
a second software code portion for connecting the processing device to a communications network via the peripheral device, the peripheral device having a transceiver;
a third software code portion for screen scraping data from the processing device; and a fourth software code for routing screen scraped data between the processing device and the communications network over the means for communication; wherein the first software code portion is adapted to use the generic communication protocol for transferring the screen scraped data between the processing device and the peripheral device.

The first software code portion can be adapted to present the peripheral device to the processing device as a human interface device and wherein the pre-installed generic driver is a human interface device driver. The first software code portion can be adapted to present the peripheral device to the processing device as a mass storage device and wherein the pre-installed generic driver is a mass storage device driver. The first software code portion can be adapted to present the peripheral device to the processing device as a composite device and wherein pre-installed generic drivers drive different device interfaces independently.

The executable software code can comprise fifth code for providing a means for connecting to the communications network including a base node. The third code can be for providing means for capturing video frame buffers of the

processing device.

The executable software code can comprise sixth code for providing a means for encoding, compressing and optionally encrypting the screen scraped data and sending the screen scraped data the communication network. The executable software code can comprise seventh code for providing a means for handling the peripheral device. The executable software code can comprise eighth code for providing means for initiating connection to the base node. The executable software code can comprise ninth code for receiving inputs from an input device on the peripheral device. The executable software code can comprise tenth code for providing a means for sending state changes to the visual indicator on the peripheral device. The executable software code can comprise eleventh code for providing a means for sending state changes to the visual indicator on the peripheral device. The executable software code can comprise twelfth code for providing a means for presenting to the user a GUI. The executable software code can comprise thirteenth code for presenting a GUI for administration of the said executable software code when executed as a portable application. The executable software code can comprise fourteenth code for providing a means for displaying and activating a key on the display of the client processing device for allowing a user to input the start the transfer of data from the processing device to the base node.

In another aspect the present invention provides a peripheral device for providing communication connectivity to a processing device which is provided with memory, a display and an operating system with at least one pre-installed generic driver providing a generic communication protocol for communication between the processing device and a standard class of peripheral devices, the peripheral device comprising a memory in which executable software code is stored for execution on the processing device, said executable software code comprising:

a first software code portion for setting up, by means of the pre-installed generic driver of the operating system, a means for communication between the peripheral device and the processing device;

a second software code portion for connecting the processing device to a communications network via the peripheral device, the peripheral device having a transceiver; and

a third processing software code for routing data between the processing device and the communications network over the means for communication;

wherein the first software code portion is adapted to use the generic communication protocol for transferring the data between the processing device and the peripheral device, and an input device coupled to the peripheral device, the input device being adapted to react to a user action to trigger the transfer of the data from the processing device to the peripheral device.

The first software code portion can be adapted to present the peripheral device to the processing device as a human interface device and wherein the pre-installed generic driver is a human interface device driver. The first software code portion can be adapted to present the peripheral device to the processing device as a mass storage device and wherein the pre-installed generic driver is a mass storage device driver. The first software code portion can be adapted to present the peripheral device to the processing device as a composite device and wherein pre-installed generic drivers drive different device interfaces independently.

The input device is preferably a physical actuator coupled to the peripheral device. The physical actuator preferably has a surface area of between 100 and 14,400 square mm. The input device can be for example a key for display on the display. The executable software code can comprise fourth code for providing a means for connecting to the communications network including a base node. The executable software code can comprise fifth code for providing a means for capturing video frame buffers of the processing device. The executable software code can comprise sixth code for providing a means for encoding, compressing and optionally encrypting the video frames and sending them over a secure link to the base node. The executable software code can comprise seventh code for providing a means for handling the peripheral device. The executable software code can comprise eighth code for providing a

means for initiating connection to the base node. The executable software code can comprises ninth code for receive inputs from an input device on the peripheral device. The executable software code can comprise tenth code for providing a means for sending state changes to the visual indicator on the peripheral device. The executable software code can comprise eleventh code for providing a means for presenting the user a GUI. The executable software code can comprise twelfth code for presenting GUI for administration of the executable software code when executed as a portable application. The executable software code can comprise thirteenth code for providing a means for displaying and activating a key on the display of the processing device for allowing a user input to start the transfer of data from the processing device to the base node.

In another aspect of the invention a peripheral device is provided for providing communication connectivity to a processing device which is provided with memory, a display and an operating system with at least one pre-installed generic driver providing a generic communication protocol for communication between the processing device and a standard class of peripheral devices, the peripheral device comprising a memory in which executable software code is stored for execution on the processing device, said executable software code comprising:

a first software code portion for setting up, by means of the pre-installed generic driver of the operating system, a means for communication between the peripheral device and the processing device;

a second software code portion for connecting the processing device to a communications network via the peripheral device, the peripheral device having a transceiver;

a third software code portion for receiving media content from the network and for displaying the media content on the display in accordance with a set of rules; wherein the first software code portion is adapted to use the generic communication protocol for transferring the media content between the peripheral device and the processing device.

The executable software code can comprise fourth code for providing a means for correctly configuring a receiver as an access point. The executable software code can comprise fifth code for providing a means for listening for output of connection units trying to connect on a specific port. The executable software code can comprise sixth code for providing a means for a GUI for administration purposes. The executable software code can comprise seventh code for providing a means for publishing its presence over the network using the zeroconf protocol. The executable software code can comprise eighth code for providing a means for accepting and installing software updates. The executable software code can comprise ninth code for providing a means for providing facilities for pairing of connection units to the processing device. The executable software code can comprise tenth code for providing a means for auto- composing of different incoming arbitrary media streams and rendering of composited image on display. The executable software code can comprise eleventh code for providing a means for receiving, decrypting and decoding incoming arbitrary media content. The executable software code can comprise twelfth code for scaling of incoming arbitrary media streams. The executable software code can comprise thirteenth code for providing a means for displaying incoming arbitrary media content in accordance with a set of rules.

The present invention also provides a method for communicating arbitrary media content from users at a meeting comprising:

operating a display node of a communications network, the display node being coupled to a first display, to receive user selected arbitrary media content and to control display of the user selected arbitrary media content on the first display; and connecting a peripheral device to a port of a processing device and communicating the user selected arbitrary media content via the communications network,

loading a program onto the processing device and running the program on the operating system of the processing device to obtain user selected arbitrary media content, said program leaving a zero footprint on termination, and triggering transfer of said user selected arbitrary media content to said transmitter through said port after a user action on an input device. The present invention also provides a peripheral device comprising:

a base

a connector for connection to a plug and play port of a host processing device,

a flexible connection between the base and the connector for transferring data signals and power,

an actuator on the base for actuating a signal and for transferring the signal to the connector for transfer to the port, wherein the base has electronics comprising permanent storage for storing a portable application, a processing engine, a transceiver and a visual indicator. The present invention also provides a method for providing communication connectivity from a processing device,

setting up a communications network between a base node of the communications network and a peripheral device coupled to the processing device;

transferring media content between the processing device and the peripheral device, transmitting the media content from the peripheral device to the communications network,

receiving media content from the communications network at the base node and displaying the media content on a display in accordance with a set of rules. Any of the above software code stored on a non-transitory storage medium.

Definitions

The term "unilateral electronic access to the display device" by a participant, means that the displaying process is obtained by the act ion of only one participant involved in the meeting, without requiring the agreement of another or the others. The term "unilateral" implies that the data for display is allowed to override or replace any data displayed on the screen by the same or another participant of the meeting.

"Plug and play" is a term used to describe the characteristic of a computer bus, or device specification, which facilitates the discovery of a hardware component in a system, without the need for physical device configuration, or user intervention in resolving resource conflicts. Plug and play devices can be added to a bus of a computing system (while running or when shut down), and the

newly added device and possibly the rest of the computing system is automatically configured to make the newly added device work, both from hardware and from software perspective. Plug and play interfaces include for example (not an exhaustive list): Firewire (IEEE- 1394), PCI, Mini PCI, PCI Express, Mini PCI Express, PCMCIA, PC Card, Universal Serial Bus (USB), SDIO cards.

"Auto-configuration" is the automatic configuration of devices without manual intervention, without setting any switches or jumpers, and without any need for software configuration. An example of auto-configuring devices: USB devices. Examples of auto-configuring protocols: DHCP, Zeroconf, Bonjour.
A plug and play device has auto-configuration software by default to make it plug and play. Example: USB devices are made to be plug and play by including the correct auto-configuration software (e.g. host driver, host stack, application software).

Autoconfiguration can also refer to a software alone and is not restricted to a physical device. "Hot swapping and hot plugging" are terms used to describe the functions of replacing computer system components without shutting down the system. More specifically, hot swapping describes replacing components without significant interruption to the system, while hot plugging describes the addition of components that would expand the system without significant interruption to the operation of the system. A well- known example of this functionality is the Universal Serial Bus (USB) that allows users to add or remove peripheral components such as a mouse, keyboard, or printer. Other examples are eSATA, PCIe, Fire Wire, for example.

A "portable application" (portable app), sometimes also called standalone, is a computer software program designed to run without installation on the target machine. This type of application is stored on a removable storage device such as a CD, USB flash drive, flash card, or floppy disk - storing its program files, configuration information and data on the storage medium alone. It is a program that can be stored on an electronic device such as a USB flash drive,

iPod, memory card, portable hard drive or other portable electronic device and runs on a computer or other processing device coupled to the electronic device without making permanent configuration changes to the host computer. All such programs have a zero-footprint, meaning all temporary files, registry entries, and any other changes to the machine exist only while the program is running. To be considered a portable application, for purpose of this invention, a software program must:

- Not require any kind of formal installation onto a computer's permanent storage device to be executed, and can be stored on a removable storage device such as USB flash drive, iPod, memory card, portable hard drive or other portable electronic storage device thus enabling it to be used on multiple computers.

- Settings are stored with, and can be preferably carried around with, the software (i.e., they are written to the electronic device such as a USB drive). Settings are not stored to the registry or any other central system database of the computer.

- Leaves a zero (or near-zero) "footprint" on any PC it is run on after being used, i.e., all temporary files/registry settings should be either avoided or at least removed once the program has exited, and files created by the user can be saved directly to the same removable media as the application is stored on. A portable application does not leave its files or settings on the host computer on which it runs. For example, the application does not write to the Windows registry or store its configuration files (such as an INI file) in the user's profile; instead, it stores its configuration files in the program's directory. Another requirement, since file paths will often differ on changing computers due to variation in Windows drive letter assignments, is the need for applications to store them in a relative format. Preferably, such a program does not require a launcher program to copy necessary settings and files to the host computer when the application starts and move them back to the application's directory when it closes as this may leave a residue on the hard drive in case of power failure.

"Electronic meeting systems" (EMS) need to be distinguished on the one hand from classic groupware, on the other from web conferencing systems. In reality, there is some overlap between minor features of products of the named categories. The main difference from groupware is the intensity of collaboration. EMS should be distinguished from systems with which it is possible to show the contents of an individual computer screen on a remote display with multiple users at the same time.

"Groupware" supports collaboration within groups where the individual contributions remain identifiable. In contrast, EMS enable the group to cooperatively produce a result for which the group is responsible as a whole. In a business process, groupware and electronic meeting systems complement each other: Groupware supports teams when researching and creating documents in the run up to an EMS session or when implementing the results of such a session. "Web conferencing systems" and "electronic meeting systems" complement each other in the online meeting or workshop: EMS extends the web conferencing system by providing interactive tools for producing and documenting group results. On the other hand, "web conferencing systems" complement EMS with the screen sharing and voice conferencing functionality required in synchronous online meetings and not present in EMS.

"Data conferencing" refers to a communication session among two or more participants sharing computer data in real time. Interaction and presentation devices such as a screen, keyboard, mouse, camera, etc. can be shared. It is a term used to distinguish from video conferencing and audio conferencing. The data can include screen, documents, graphics, drawings and applications that can be seen by the participants of the meeting.

"Application sharing" is an element of remote access, falling under the collaborative software umbrella, that enables two or more users to access a shared application or document from their respective computers simultaneously in real time. Generally, the shared application or document will be running on a

host computer, and remote access to the shared content will be provided to other users by the host user. Application sharing should be distinguished from systems in which collaboration on the applications between different users is not possible but the contents of individual computer screens can be projected onto a remote display with multiple users at the same time.

The term "arbitrary media content" refers to the fact that a user may generate, create or select any media content that is appropriate to display, i.e. on an *ad hoc* basis. This differs from client voting on, or selecting of media content that is displayed by another in a meeting or presentation. This term refers to client oriented, distributed rights and privileges for the display of content rather than a central presenter providing content which is presented to the members of the meeting.

"Screen scraping" in our sense refers to reading the video frame buffers and processing them, rather than just rendering them on a display. Screen scraping for presentations is described in US2002/0196378 to Slobodin et al which is included herein by reference.

"Auto composition" or "auto layout" refers to the automatic nature in which multiple graphics/video sources are rendered on a central display, without user intervention and in a way that a user would intuitively expect it to happen.

"Wireless" and "wireless communication network" can be any network that does not use cable links between nodes, e.g. uses RF, optical or InfraRed for communication purposes, such as IrDA, diffuse infra-red, WLAN, WiMax, WiFi, WiFi Direct, Bluetooth or any other wireless communication network known to the person skilled in the art such as optical networks like LiFi.
"Computer" generally refers to a processing device, i.e. having a processing engine capable of various types of digital processing, such as rendering graphics images for display. A computer can be in the form of a work station, a personal computer, a laptop, a palm top, a PDA, a smartphone, a tablet etc. Generally a computer has memory such as volatile RAM. Non- volatile memory

such as a hard disc, optical disk or solid state memory can be included in the computer or can be a peripheral device. Currently most computers are electronic but the term "computer" also includes optics based computing devices.

The term "pre-installed generic driver" is intended to mean a driver which is installed on a processing device such as a computer as a standard driver, e.g. is installed with the installation of the operating system. Such a driver is standard for the operating system and can drive a standard class of peripheral devices coupled to or connected to the processing device. The installation of a specific driver for such a peripheral device is not required. Such a generic driver can be a human interface driver (HID) or a mass storage device driver, which has predetermined software components configured for driving mass storage, a CD-ROM, a keyboard etc. or combinations of these. Such devices can be readable and writable computer peripheral memory devices such as USB memory sticks, flash memories, external hard drives, or more. Brief

Descriptions of the drawings

Fig. Ia shows a meeting room that can be used with embodiments of the present invention. Fig. Ib shows a combination of a client processing device, a connection unit, a base node and a display in accordance with an embodiment of the present invention.

Fig 2 shows a screen display in accordance with an embodiment of the present invention.

Figs. 3 to 5 show a base node and a peripheral device and a client processing device in accordance with embodiments of the present invention.

Fig 6 shows a display in accordance with an embodiment of the present invention. Fig. 7 shows a peripheral device in accordance with an embodiment of the present invention.

Fig. 8 shows a client processing device in accordance with an embodiment of the present invention.

Fig. 9 shows a further client processing device in accordance with an embodiment of the present invention.

Fig. 10 shows an embodiment of a peripheral device in accordance with an

embodiment of the present invention.

Detailed Description of the Embodiments of the present Invention

The present invention will be described with respect to particular embodiments and with reference to certain drawings but the invention is not limited thereto but only by the claims. The drawings described are only schematic and are non-limiting.

Furthermore, the terms first, second, third and the like in the description and in the claims, are used for distinguishing between similar elements and not necessarily for describing a sequential or chronological order. The terms are interchangeable under appropriate circumstances and the embodiments of the invention can operate in other sequences than described or illustrated herein. Moreover, the terms top, bottom, over, under and the like in the description and the claims are used for descriptive purposes and not necessarily for describing relative positions. The terms so used are interchangeable under appropriate circumstances and the embodiments of the invention described herein can operate in other orientations than described or illustrated herein. The term "comprising", used in the claims, should not be interpreted as being restricted to the means listed thereafter; it does not exclude other elements or steps. It needs to be interpreted as specifying the presence of the stated features, integers, steps or components as referred to, but does not preclude the presence or addition of one or more other features, integers, steps or components, or groups thereof. Thus, the scope of the expression "a device comprising means A and B" should not be limited to devices consisting only of components A and B. It means that with respect to the present invention, the only relevant components of the device are A and B. Similarly, it is to be noticed that the term "coupled", also used in the description or claims, should not be interpreted as being restricted to direct connections only. Thus, the scope of the expression "a device A coupled to a device B" should not be limited to devices or systems wherein an output of device A is directly connected to an input of device B. It means that there exists a path between an output of A and an input of B which may be a path including other devices or

means.

Elements or parts of the described devices may comprise logic encoded in media for performing any kind of information processing. Logic may comprise software encoded in a disk or other computer-readable medium and/or instructions encoded in an application specific integrated circuit (ASIC), field programmable gate array (FPGA), or other processor or hardware. References to software can encompass any type of programs in any language executable directly or indirectly by a processor.

References to logic, hardware, processor or circuitry can encompass any kind of logic or analog circuitry, integrated to any degree, and not limited to general purpose processors, digital signal processors, ASICs, FPGAs, discrete components or transistor logic gates and so on.

Embodiments of the present invention provide solutions to three major problems with meetings: a) the time taken to prepare for a meeting. This is mainly achieved by allowing "on- the-fly" presentation of any displayable information. This information does not have to be linked into any particular presentation software, nor to be compatible with any such presentation software,

b) the time taken to conduct the meeting using electronic meeting tools. This is achieved by reducing the time to connect computers to the display or projection system.

c) the time taken to reflect and review and document the meeting afterwards. This is achieved by providing the possibility of recording the course of the meeting in the same time sequence that it was carried out as well as be able to store all data presented and who presented it.

First Embodiment

Fig. Ia is a schematic representation of a generic meeting room 30 with a meeting table that can be used with embodiments of the present invention. Participants 37 having some form of processing device 31 such as a laptop

computer, a tablet, a PDA etc. Each of the processing devices 31 can be a host device and has a first connection unit 47 to which it is coupled. The first connection unit 47 provides access to a network 50 which in this case is a wireless network, but could be a wired network. The network can be a shared resource network. Each connection unit 47 may be coupled to an input device 48 which will be described in more detail later. A user 37 will typically at a distance from the processing device 37 which is ergonomically satisfactory. This ergonomic boundary is typically an area of about 1000 sq cm to 4000 sq cm. This ergonomic boundary will typically have the user as one side of the boundary and the comfortable reach of the arms will determine an area on the left and right of the processing device which falls within the ergonomic boundary and the far edge of the boundary of the processing device (normally delimited by a display screen) will determine the other side of the ergonomic boundary. The area defined by the ergonomic boundary will overlap or include the processing device 31 itself. The processing device will also have an outer physical boundary. The input device 48 is preferably arranged to operate outside the boundary of the processing device 31 but within the ergonomic boundary. Preferably the input device is arranged to function when it is flat on the table. The input device preferably has an size of activation area of between 1 and 144 square cm. In other embodiments of the present invention a wireless memory card can be provided to enable a second Wi-Fi link on a processing device such as a laptop or tablet. The wireless memory card stores data and media and fits into the laptop just like a regular SDHC card. The wireless memory card preferably has built-in Wi-Fi that effortlessly transfers data, photos and videos to another device or computer. For instance an Eye-Fi card (www.eye.fi) can be used to enable the latter,

Preferably the network 50 is a local area network, (e.g. a shared resources network) i.e. preferably local to the meeting room for security reasons but the network 50 may have access to other local or wide area networks such as 51 or to a larger corporate network or the internet 43, for example via a router 42. Another node of the network 50 is the base or display node 36. This node 36 may optionally be a wireless access point. The base node 36 may also be a

processing device or host computer and may be coupled to a second connection unit 49 that provides access to the network 50 thus linking all of the processing devices 31, 36 together. The connection unit may have an input device as described above. Alternatively, network connections installed on the base node 36 can be used. Audio equipment 46 may be provided, e.g. a telephone that allows other members of the meeting to call in from remote destinations.

The display node 36 is coupled to and adapted to allow display of media on some kind of display 44. The display node is in embodiments of the present invention a base node of the communications network 50. The display 44 may be a projector and/or screen, the projector being coupled to the base node 36. A whiteboard 45 can optionally be provided that can be optionally coupled to the display 44 and/or the base node 36, e.g. when the whiteboard can record electronically what is written on it. Optionally, a camera 35 may be provided to record the entries on the whiteboard 45. The camera 35 may have a third connection unit 52 for connecting the camera 35 to the network 50 so that the data from the whiteboard can be recorded and stored or transmitted to other networks via router 42. The connection unit 52 may have an input device 53 as described above for the connection unit 47.

Optional equipment can be cameras 39, 40, 41 for recording the progress of the meeting. These cameras can be linked by a network 51 , e.g. a cable network to the router 42 and/or the base node 36. Another optional item is a microphone or microphones 38 that can be used to transfer audio, e.g. to the processing devices 31 and to loud speakers (not shown) attached to the base node 36 or part of the display 44.

Any or all of the outputs of the processing devices 31, the cameras, the whiteboard, etc. can be recorded and stored digitally, e.g. in node 36 or elsewhere to provide a complete record with correct time sequence. Summarising the above, the present invention provides an electronic meeting tool for communicating arbitrary media content between different users 37 (with

their own processing devices 31, e.g. PC, mobile phone, or tablet) and one display or projector or multiple displays or projectors 44 in the meeting room 30.

Referring to Figs, Ia and Ib embodiments of the present invention comprise a base or display node 36 being a processing device, e.g. a host computer adapted to receive user selected arbitrary media content, the base node 36 being coupled to a central display 44 which can be a fixed format display and/or a projector or similar. The arbitrary media content can be provided from any of the user processing devices 31. The base node 36 can be adapted to display the received user selected arbitrary media content in accordance with a set of rules, e.g. FIFO, automatically, on request or approval, forced to display, in accordance with a priority etc. Optionally the base node 36 is adapted to force display of the received user selected arbitrary media content, i.e. to allow participation in the meeting by an individual user displaying own selected content on display 44 independently of the person who is nominally responsible for giving a presentation or chairing the meeting. Forcing the display can also be considered as a rule. The phrase "unilateral electronic access to the display device" defines this kind of rule as "unilateral" means that the displaying process is obtained by the act ion of only one participant involv ed in the meeting, without requiring the agreement o another or the others. The term "unilateral" implies that the data for display is allowed to override or replace any data displayed on the screen by the same or another participant of the meeting. The meeting tool can also be adapted to allow a priority setting. This means that a user can set a priority setting for the media to be displayed. A priority of "1" for example can be interpreted by the base node as a forced display, a priority "2" can be interpreted by the base node as display as soon as possible, priority "3" can be interpreted by the base node as place in queue and display as the time comes etc. Setting and using priorities for display are also considered to be working to rules. To execute the rules, the base node 36 may have a decision module. The base node 36 may be a host computer having a processing engine such as a microprocessor and a memory. Preferably, the base node 36 is adapted to treat media content passed to the base node 36

from any or all of the connection units 47 in an equal manner. The base node 36 may be adapted to auto compose the media content on the central display 44 connected to it, e.g. from one or more processing devices 31.

An independent aspect of the present invention is at least one connection unit 47, (optionally 49 for receiving or camera connection unit 52) adapted to communicate the user selected arbitrary media content to said base node 36. Preferably the connection units 47 and/or optionally 49 are physical plug-and-play devices. An example of a connection unit is shown schematically in Fig. 10.

The connection unit 47 (or optionally connection unit 52) may be integrated into a user processing device 31 , e.g. as an internal peripheral device or may preferably be an external peripheral device comprising a connector adapted to couple to a port of a user processing device 31. The processing device 31 may have a client display, a processing engine such as a microprocessor, a memory and an operating system. The optional connection unit 49 may integrated into the base node 36, e.g. as an internal peripheral device or may be an external peripheral device comprising a connector adapted to couple to a port of the base node 36. The connection unit 49 may be fully integrated into the base node 36, e.g. is an internal network interface of the base node 36. The base node 36 may have a processing engine such as a microprocessor, a memory and an operating system.

In alternative embodiments of the present invention, the peripheral device can be coupled wirelessly to the processing device, and paired with the processing device such as a tablet or laptop through Near-Field Communication (NFC). In other embodiments of the present invention, the pairing of the peripheral device can be performed additionally by providing means for receiving biometric data such as a microphone (voice) or a camera (face or iris) or a finger swipe (fingerprint) to the peripheral device. Then the peripheral device can be personalized, or paired, by means of voice or face recognition, respectively. The term voice recognition refers to finding the identity of "who" is speaking,

rather than what they are saying. Recognizing the speaker by voice recognition can simplify the task of translating speech in systems that have been trained on specific person's voices or it can be used to authenticate or verify the identity of a speaker as part of a security process. "Voice recognition" means "recognizing by voice", something humans do all the time over the phone. As soon as someone familiar says "hello" the listener can identify them by the sound of their voice alone.

The user processing devices 31, the connection units 47, (optionally 49, 52) and the base node 36 co-operate to form a communication network 50 for linking between at least one of the plurality of processing devices 31, 36, 35 and the central display device 44. The communication network 50 is adapted to receive arbitrary media content from at least one of the plurality of processing devices 31 and to transmit the arbitrary media content of at least one of the plurality of processing devices to the central display device 44.
In some embodiments the storage means of the peripheral device can be adapted to record or share information. For instance, the peripheral device can be adapted to further comprise a private communication channel (e.g. to enable chatting), which can communication with a private communication channel of another participant of the meeting.

An independent aspect of the present invention is a portable application 60 adapted to be loaded onto a client processing device 31 and to be run on the operating system of the client processing device 31. The portable application 60 runs as a process on the client processing device 31 that is adapted to deliver an arbitrary media content from the client processing device 31 to the communication network 50 in response to a user action applied to an input device 48, the process leaving a zero footprint on the processing device 31 on termination. The network 50 can be a shared resource network. Optionally the portable application 60 is stored on each connection unit 47 and optionally 49. Preferably the portable application 60 is adapted to "screen scrape" content of the client display of the client processing device 31. Optionally the portable application 60 when run on a processing device 31 is adapted to "screen

scrape" content of the client display of this client processing device 31 and to transmit it via a connection unit 47. Optionally the portable application 60 when run on the processing device is adapted to "screen scrape" content of the client display of the client processing device 31 and to transmit it via a network interface of the processing device 31 , for example if the connection unit 47 has no transmitter or it is not functioning.

The connection unit 47 for communicating with said base node 36 has a network interface e.g. comprising a transmitter 62. The transmitter 62 is preferably a transceiver. Optionally the transmitter/receiver can be a wireless transmitter/receiver.

The base node 36 for communicating with the connection unit 47 has a receiver 63 which can be included in the connection unit 49 or integrated into the base node 36. The receiver is preferably a transceiver. Optionally the transmitter/receiver can be a wireless transmitter/receiver.

The input device 48 allows a user interaction with the connection unit 47. Preferably the input device 48 is physical actuator coupled to the connection unit 47. The user action applied to the input device 48 generates a signal that can trigger transfer of data from the processing device 31 (to which the connection unit 47 is coupled) to the network 50. Preferably the input device 48 has an activating surface that is between 100 and 14,400 square mm. Optionally the input device 48 can be a key displayed on the client display 1 of a client processing device 31. This key can be activated, e.g. by use of a pointing device such as a mouse trigger transfer of data from the processing device 31 to the network 50.

The connection unit 47 is preferably provided with a visual indicator 61, e.g. for allowing user feedback from the connection unit 47 of the status of any activity. The system also can include a server program 64 adapted to be loaded onto the base node 36, said program 64 being adapted to receive arbitrary media content from one or a plurality of client processing devices 31 through said

connection units 47, (optionally 49), and to show this plurality of arbitrary media content streams on one or a plurality of displays 44. The server program 64 may be adapted to allow display in accordance with one or more rules, e.g. FIFO, automatically, on request, forced, in accordance with a priority etc. The forcing rule can be described as "unilateral electronic access to the display device" as "unilateral" means that the displaying process is obtained by the action of only one participant involved in the meeting, without requiring the agreement of another or the others. The term "unilateral" implies that the data for display is allowed to override or replace any data displayed on the screen by the same or another participant of the meeting. To execute the rules, the server program 64 may have a decision module. Preferably, the server program 64 is adapted to treat media content passed to it from any or all of the connection units 47, 52 in an equal manner. The server program 64 may be adapted to auto compose the media content on the central display 44.

The server program 64 may be a portable application adapted to be loaded onto the base node 36 and to be run on the operating system of the base node 36. The portable application 64 runs a process on the base node 36 that is adapted to display an arbitrary media content received from the client processing device 31 via the communication network 50, the process leaving a zero footprint on the base node 36 on termination. Optionally the portable application 64 is stored on each connection unit 49 and optionally 47 and can be installed therefrom.

Meetings in which visual information is presented on a display or projector commonly suffer from a monopoly effect: one single presenter determines the display contents and thereby has a disproportionate power to influence the meeting dynamics and thereby its outcome. Embodiments of the present invention solve this problem by allowing multiple individuals to simultaneously show their information. The present invention provides according to some embodiments a method to override all currently displayed material. In a sense the method of the present invention transforms visual communication into something akin to talking, i.e. full-duplex and with the option to shout and

interrupt.

The system may also include a central display device 44 and optionally a whiteboard 45 or other display means such as a printer. The display 44 being adapted to receive user selected arbitrary media content, and may be adapted to allow display of the received user selected arbitrary media content in accordance with one or more rules, e.g. FIFO, automatic, forced, on request or approval, in accordance with a priority etc. The forcing rule can be described as "unilateral electronic access to the display device" as "unilateral" means that the displaying process is obtained by the action of only one participant involved in the meeting, without requiring the agreement of another or the others. The term "unilateral" implies that the data for display is allowed to override or replace any data displayed on the screen by the same or another participant of the meeting.

Optionally, one of the connection units 47 can be adapted to be a master connection unit. Such a master connection unit may be adapted to instruct the base node when media content from a client processing device 31 may be displayed or which of the processing devices may be allowed to send content for display.

In embodiments of the present invention, at least one portable application is used, e.g. for the client software on a client processing device 31 or optionally on the base node 36. In these embodiments, one of the pre-installed generic drivers of the operating system on the relevant computer device 31, 36 is exploited for setting up communication from the computer device 31 , 36 to the network 50 via the connection unit 47, (optionally 49). The generic driver is used in connection with the connection unit 47, (optionally 49) operating as a peripheral device but the use can go beyond that of the standard class of peripheral devices for which the generic driver is intended. In some embodiments the connection unit 47, (optionally 49) operated as a peripheral device communicates with the relevant processing device 31, 36 by using a

generic communication protocol provided by the pre-installed generic driver. Pre-installed USB drivers are examples.

Preferably the setting up of the communication of network 50 using connection unit 47, (optionally 49) does not alter or affect the networking capability of the relevant processing device 31, 36. For example, if a browser is started on the client processing device 31, this browser can use the standard network interfaces on the processing device 31. This means that transfer of data via the connection unit 47 (optionally 49) is independent of transfer of data over the network interfaces of processing device 31 or 36. This has the advantage that each user can carry out processing such as searching on the internet to gather data independently of the transfer of data to be displayed during a meeting, or receive emails etc.

The use of a portable application has the advantage that any modification to settings in the register or generally in the operating system can be avoided, so that upon any form of termination, e.g. disconnecting the electronic device, system crash, no trace is left. This is generally termed "zero footprint".

The present invention has the advantage of scalability. It can provide a display system for use by a plurality of users in meetings. Every user in the meeting thus can have a client processing device 31 for coupling to a connection unit 47. A first user action connects the client processing device 31 to the base node 36, e.g. by inserting a connection unit 47 into the relevant interface connector on the processing device 31, e.g. a USB interface. A second user action comprising activating a button or key on the input device (e.g. by depressing it) then starts the process of transmitting arbitrary media content from the client processing device 31 to the base node 36. This process preferably includes screen scraping data from the processing device. Using screen scraping avoids special programs being installed on the base node 36 to carry out graphical commands sent from the processing device 31. When the base node 36 receives the plurality of arbitrary media content, it can allow auto composition of this media content on the central display connected to it.

In some embodiments, the button or key can be virtual button which is displayed on the screen instead of a button or key on the input device, which for instance can be the peripheral device. Preferably, when the process of transmitting arbitrary media content has been activated, the screen scraping data from the processing device does not scrape the virtual button. The latter can be enable for instance by positioning the virtual button on a second layer which is not scraped.

The present invention will now be described further with reference to certain more specific embodiments.

The present invention in some embodiments provides a system and/or a method to which in one aspect can override all currently displayed material when arbitrary material is presented on a display device from more than one source processing devices such as a laptop, PDA, smartphone, computer, tablet etc. The present invention in one aspect controls the display of visual communication and information by a method akin to talking, i.e. full-duplex and with the option to interrupt or to obtain unilateral electronic access to a display device.

One embodiment the present invention can be implemented through a connectable peripheral device e.g. a USB compatible device, such that when the peripheral device is connected to a processing device that is used to provide arbitrary information such as text, video, pictures etc., each individual user with a processing device can to gain access to the display, e.g. screen. By being present at the meeting a user can pair the peripheral device to a processing device by inserting the peripheral device. The user can also pair the peripheral device to a base node or base unit that controls the display in the meeting room and which is connectable to the peripheral device via a communications network such as a wired or wireless communications network. The network is a shared resources communications network as different devices and participants can transmit data over the network. To achieve this, the peripheral device has a transceiver capable of transmitting the arbitrary data from the processing device to the display via the base node. In one option the information displayed on the local display of the processing device is screen

scraped and transmitted. To allow this the peripheral device can include a portable application that is able to execute on the processing device leaving a zero-footprint on termination. Although a physically connectable peripheral device is convenient, the peripheral device could also be coupled to the processing device via a wireless connection, e.g. via the Bluetooth protocol. For meetings with remote participants it is not possible to rely on the same hardware connectable peripheral device to provide access from a remote location to the display in the meeting room directly. Typically, at home or in a hotel, the participant only has a phone and internet access on a laptop or some other kind of portable computing device. Remote participants lack context (e.g. non-verbal communications) and have less than ideal audio/video connections and consequently suffer from a power- asymmetry. Typically, remote participants also have no way of 'pushing' their contents on screen, since the meeting is controlled by a meeting organiser or director who orchestrates the sequence of presentations. One of the key advantages of the present invention is to provide remote collaboration while maintaining a kind of 'situational awareness'. This means that what you see has a straightforward relationship with your internal mental map. This allows keeping track of multiple information flows and being able to correlate that quickly with any other information, e.g. with a search carried out on the local computing device.

In another aspect of the present invention confusion and frustration is avoided by:

1. retaining aspect ratio of any image that is sent from any location to the display in the meeting room or displays in meeting rooms (e.g. a long thing remains a long thing)

2. not overlapping images and/or windows on any of the display devices in the meeting rooms (e.g. you never have to guess or remember what's hidden)

3. showing the same arrangement of images on each screen (everyone sees the same things and can refer to them), this means that the topological arrangement of images on each screen of multiple screens is the same,

4. maximizing the use of screen real-estate (e.g. the images presented do not have borders containing no useful information), while preferably no allowing overlapping of the images

5. allowing local manipulation of zoom and pan but allowing to return to the default layout of item 3 above
6. arranging the images on each display taking into account the local display characteristics, such as any of resolution, pixel density, aspect ratio,
7. optionally also allowing an ongoing audio connection to be heard by all participants, e.g. that verbal communications will be used to alter the contents of the screen.

With reference to Fig. 2, the base node software (6) running on a base node 36 can be adapted to display on the central display a splash screen (21) showing its readiness to receive arbitrary media content over its receiver. This splash screen (21) can also show instructions on how to use the system, as well as the configuration parameters (see later) to reach the base node 36. These configuration parameters are also shown in a transparent canvas at the bottom of the central display (22).

A client processing device 31 that wants to have its arbitrary media content displayed on the central display connected to the base node 36 is connected to a connection unit 47. The portable application 60 will be executed on the client processing device 31 as a host device. A first user interaction creates a connection between the portable application 60 and the base node 36 using the transmitter in the connection unit 47 and the receiver in the base node 36. This user action can be a connection of the connection unit 47 to the processing device 31. A second user interaction, this time on the input device 48, activates screen scraping by the portable application of the arbitrary media content from the client processing device display, which is then sent over the connector unit 47 to the base node.

The base node 36 receives the plurality of arbitrary media content coming from one or more connection units 47, and auto composes this media content for rendering on the central display.

The visual indicator 61 on the connection unit 47 indicates to the user and to other participants in the meeting that media content is being sent by that connection unit 47 to the base node 36 for display. Repeating the second user interaction on the input device 48 of a connection unit 47 decouples the media content from that connection unit 47 from the base node 36. The base node 36 removes that media content from the composed image on the central display and recomposes the remaining content on the central display. The content on the central display/projector is auto arranged as shown in figure 2. When user 1 adds content, his/her display will be scaled to fill the available central display canvas as much as possible, but without affecting the aspect ratio. When user 2 adds in, his content is added to the side of the first image. When user 3 adds his content, the arrangement is a suitable one such as triangle wise. Adding user 4, the image becomes a 2 by 2 tiling, which is the maximum available. When an additional user attempts to add content, he will be blocked. When a user initiates action to remove his/her content, his/her media content is removed from the central display and one moves backward in the composition sequence shown in figure 2.

Base node software

The base node software has one or more of the following features:

- First code for providing a means or a method step for correctly configuring the receiver of the base node.
- Second code for providing a means or a method step for listening for output of connection units trying to connect on a specific port.
- Optionally, third code for providing a means or a method step for a GUI for administration purposes, offered for example over a web interface.
- Optionally, fourth code for providing a means or a method step for publishing its presence over the network using the zeroconf protocol.
- Optionally, fifth code for providing a means or a method step for accepting and installing software updates of the base node as well as for the portable application software for the connection units.
- Sixth code for providing a means or a method step for providing facilities for pairing of connection units to the base node.

- Seventh code for providing a means or a method step for auto-composing of different incoming arbitrary media streams and rendering of composited image on display or projector screen.
- Eighth code for providing a means or a method step for receiving, decrypting and decoding incoming arbitrary media content.
- Optionally ninth code for providing a means or a method step for scaling of incoming arbitrary media streams Optionally tenth code for providing a means for displaying incoming arbitrary media content in accordance with a set of one or more rules.

Any of the above code may be stored on a non-transitory machine readable storage medium such as an optical disk, a magnetic disk, magnetic tape, solid state memory, USB mass storage device etc.

Portable application for the client processing device

The portable application comprises an algorithm for screen scraping. Screen scraping algorithms include VNC and RDP or similar. The algorithm may include a combination of algorithms such as VNC and RDP that are optimized for different content, e.g. static text or video. The portable application has one or more of the following features:

- Eleventh code for providing a means or a method step for connecting to a network including the base node.
- Twelfth code for providing a means or a method step for capturing video frame buffers of the client processing device, i.e. computer (C), also called screen scraping.
- Thirteenth code for providing a means or a method step for encoding, compressing and optionally encrypting these video frames and sending them over a secure link to the base node. Only changed areas such as rectangles or triangles of the screen (or any other suitable geometrical shape) need to be transferred, and different types of rectangles or triangles are encoded in different ways (e.g. RLE, JPEG,...) to optimise performance.
- Fourteenth code for providing a means or a method step for handling the connection unit.

- Fifteenth code for providing a means or a method step for initiating connection to base node.
- Sixteenth code for receive inputs from the input device on the connection unit.
- Seventeenth code for providing a means or a method step for sending state changes to the visual indicator on the connection unit.
- Optionally, eighteenth code for providing a means or a method step for presenting the user a GUI (18).
- Optionally, nineteenth code for presenting GUI for administration of the portable application.
- Optionally, twentieth code for providing a means or a method step for displaying and activating a key on the display of the client processing device for allowing a user input to start the transfer of data from the client device to the base node.

Embodiments of the present invention provide a frame grabber. A frame grabber, known in the prior art, is an electronic device that captures individual, digital still frames from an analog video signal or a digital video stream. It is usually employed as a component of a computer vision system, in which video frames are captured in digital form and then displayed, stored or transmitted in raw or compressed digital form. In recent years, connections via USB, Ethernet and IEEE 1394 ("Fire Wire") interfaces have become prevalent. The frame grabber of the present invention, enables HDMI or Display Port capture instead via USB. The frame grabber preferably functions as follows:

- Connect to the base unit using a TCP/IP socket interface.
- Capture the video frame buffers of the computer,
- Encode, compress and encrypt these video frames and stream them over a secure link to the base unit. Only changed rectangles of the screen are transferred, and different types of rectangles are encoded in different ways (e.g. RLE, JPEG,...)
- Present the user a GUI

Any of the above code may be stored on a non-transitory machine readable storage medium such as an optical disk, a magnetic disk, magnetic tape, solid state memory, NAND Flash, etc.

In this embodiment the portable application stored on the connection unit, and is executed in an execution context on the client processing device. The portable application does not need to be copied to or installed on the computer. It can be executed directly from the connection unit. It will only be copied temporarily into an execution context on the client processing device. There are also no changes in configuration required or settings in the client processing device. This means that nothing will remain on the client processing device when the connection unit is removed. It also implies that the portable application will run on client processing devices where the user does not have the necessary access rights to install software.

The portable application is designed in such a way that
- No specific drivers need to be installed on the client processing device.
- Pre-installed drivers are used, e.g. for classes of peripheral devices.
- It is independent from vendor specific graphics hardware.
- It runs on at least one and preferably on a variety of different client processing devices, including Windows, Mac OS/X, Linux, Android, iOS and many others.

Advantages

The present application has one or more of the following advantages:
- No need for a master role in the meeting
- Standard plug and play connectivity of connection units to base node
- Simple and well known user actions are employed
- Own networking facilities of client processing devices not blocked
- No configuration changes on the client processing device
- Input devices are easily accessible; e.g. large size
- Program updates of portable application and server program can be performed locally
- Portable applications are used, no installation, multi-platform, no vendor

specifics

- Particular implementation of screen scraping done by portable application avoids vendor specific graphics devices
- Standard drivers are used so no need to install extra drivers
- No configuration changes on the client processing devices
- Zero footprint applications on client processing devices - nothing to clear up or adjust or reset
- Own networking facilities of client processing devices not blocked - No configuration changes on the user computers
- Low virus, malware and spyware risk

The portable application may be stored on a non-transitory machine readable storage medium such as an optical disk, a magnetic disk, magnetic tape, solid state memory, nand Flash etc.

Second Embodiment

In the second embodiment, referring to Figs. 2 to 5, the base node is a separate physical processing device called base unit (B), comprising permanent storage, memory, a processing engine, a wireless access point (4), a plug and play interface such as a USB port (11), a graphics display output adapter (5) like VGA/DP/DVI/HDMI, and optionally an audio output adapter (27). An input device having an actuator such as a button 13 and a visual indicator 14 are optional.

The connection unit is a physical device in the form of an external peripheral device (shown in the drawings as a "dongle" D) comprising permanent storage storing the portable application (7) and configuration parameters (12), memory, a processing engine (e.g. CPU, FPGA), a wireless transmitter such as WiFi (3) or other wireless transmitters such as LiFi, a plug and play interface such as a USB interface (2), a button as input device (9), an LED ring as visual indicator (10). The portable application is stored on the peripheral device (7). The client processing device is host device, for example a computer or laptop comprising a display, a plug and play interface such as a USB port (2), memory, and a

processing engine such as a microprocessor.

The system thus comprises:

- an external peripheral device (D) that has a plug and play interface such as a USB interface (2) on one end and a communications interface such as a wireless interface configured as client (3) on the other end.
- a base unit (B) that has a communications interface such as a wireless interface configured as access point on one end (4) and a video card adapter (5) like VGA, DVI, DP or HDMI on the other end.
- a portable application (7) stored on the peripheral device (D) but executed on the client processing device (C)
- a base node software (6) stored and executed on the base unit (B)

The external peripheral device (D) also preferably has any one or any combination of:

- a large button as actuator for the input device (9) allowing user interaction with the peripheral device. The button preferably has an actuation surface area of between 100 and 14,400 square mm.
- visual indication such as a LED (10) allowing user feedback from the peripheral device. The user feedback can be in the form of a light ring.

An advantage of embodiments of the present invention is to provide data transfer to the peripheral device via a peripheral interface such as a USB interface on any processing device such as a computer in a manner that is largely operating system independent and without leaving a footprint (Zero-Footprint). Installation of drivers and/or applications onto such a processing device as a computer is not necessary wherever pre-installed generic drivers are present. Administrator rights on the processing device such as a computer are preferably not necessary. To avoid the need for administrator rights, embodiments of the present invention use other peripheral device pre-installed drivers such as USB class drivers supported without any extra installation. Embodiments of the present invention route at least screen scraped data presented by client software running on the processing device for transfer to a

communications network via a peripheral device such as a USB device. This bypasses any network interface of the processing device C (and hence many firewalls) but only for the specific client software. Other applications are not affected and can make use of the standard network interfaces, i.e. packets from/to the TCP/IP stack are transferred to a network device as normal. The client software is launched from the peripheral device such as a USB composite device or storage device as a portable application, which can avoid that any traces are left on the host OS.

Basic usage scenario of the second embodiment

The base node software (6) displays on the projector a splash screen - (21) in figure 5 - showing its readiness to receive arbitrary media content over its receiver (4). This splash screen (21) also shows instructions on how to use the system, as well as the configuration parameters (see later) to reach the base node. These configuration parameters can also be shown in a transparent canvas at the bottom of the central display (22).

To avoid user interaction for the configuration of the connection between peripheral device and base unit, a pairing process is used. This pairing process provides the peripheral device, i.e. the connection unit with networks parameters needed to set up the local network. As an example, the peripheral device can be briefly plugged into the USB port (11) of the base unit (B). The base unit then optionally does a software validity check, optionally does a software update of the portable application stored on the peripheral device, and writes the connection parameters on the peripheral device (D) required for the peripheral device and base unit to find each other to the permanent storage (8). For example, when using WiFi, this could be the SSID, WEP/WPA2 keys and IP address and port number of the base unit's receiver, as well as the port number used by the base node software, but not all of these are necessarily needed to be exchanged.

A client processing device that wants to have its arbitrary media content displayed on the central display connected to the base node (5) connects a peripheral device (D) to its USB port via (2). The peripheral device presents itself to the computer over interface (2) as a composite device comprising a

mass storage device and a keypad. This has the major advantage that no specific driver is required, since all these devices are natively supported in every personal computer system that has a USB port. If autorun is enabled, then the computer will automatically execute the client software (7) stored in mass storage (8) on the peripheral device. The first user interaction mentioned in the general case is then just the connection of the peripheral device to the USB port. If security measures disabled auto-run, the user needs to explore the mass storage on the mass storage of the peripheral device and start the portable application manually.

The portable application will use the wireless, e.g. WiFi or LiFi interface of the peripheral device (3) to connect to the correct base node. To know the right base unit to connect to, the configuration parameters needed to make this connection are stored in the database (12) on the mass storage device (8) during the pairing process described earlier.

Once the connection is made, the peripheral device goes into connected mode. This means that there is now at least one channel from the peripheral device to the base unit. The content is not shown yet. The LED (10) on the peripheral device now turns white to give a visual indication of this new state.

When the user at the computer (C) wants to show her content, she presses the button (9). When the button was previously in state "connected" (see figure 6), it will check the state of the base unit (P). If the base unit is not in state "full", the peripheral device will send the screen scraped arbitrary media content to the base unit (B), which will add the media content to the composition on the central display. The peripheral device LED (10) now turns red to indicate "showing" state (figure 6).

The button (9) acts as a toggle. When the user presses the button again, that computer displays content will be removed from the projector. The LED (10) goes back to white.

Use of the auto-run feature is optional if possible and enabled on the computer (C) to start the client software (7) as soon as the peripheral device is plugged in. On Windows for example, this means mounting the peripheral device as a mass storage device and using the autorun.inf file stored on the peripheral device.

In many cases however, this auto-run feature will be disabled for security reasons. In that case, we will, if possible and enabled on the computer (C), use the auto-play feature to show the logo of the connected peripheral device on the desktop of the computer. The user then needs to double click on that logo to start the client software. If the auto-play feature as described above is also not possible or enabled, the user must browse to the file system of the connected peripheral device and start the application manually. This means double clicking the client.exe file on Windows, client. app on Mac OS/X or tapping the appropriate application icon on a tablet or any mobile device with touch screen.

Third Embodiment: Portable application stored on standard solid state memory such as a USB stick.

In the third embodiment, the portable application is stored on a solid state memory such as a regular USB memory stick (figure 7).

With a solid state memory such as a regular USB memory stick, there is no input device, visual indicator or transmitter of the kinds described above for the connection unit. This means that the system needs to :

- Use the transmitter/receiver from the client processing device.
- Use as input device a key or button on the client processing device like a physical key on the keyboard, a special mouse press, a button area on a touch screen, a button displayed on the screen to be clicked on with a mouse pointer.
- Present the visual indicator on the client processing device's display.

The client processing device then looks like figure 8.

This embodiment provides a peripheral interface such as the USB interface on any processing device acting as a host device such as a computer in a manner that is largely operating system independent. Installation of drivers and/or applications onto such a processing device as a computer is not necessary wherever pre-installed generic drivers are present. Administrator rights on the processing device such as a computer are preferably not necessary. To avoid the need for administrator rights, this embodiment uses other peripheral device pre-installed drivers such as USB class drivers supported without any extra installation. This embodiment of the present invention routes at least screen scraped data presented by client software running on the processing device for transfer to a communications network via a network connection of the processing device. The client software is launched from the peripheral device such as the USB device as a portable application.

The first user operation then comprises:
- plugging in the solid state device such as a USB memory stick,
starting the portable application (if autorun is disabled)
- configuring the transmitter, such as the wired or wireless network interface, on the client processing device to connect to the correct base node, using the configuration parameters (22) shown on the central display
- triggering the connection of the portable application with the base node, for example by interacting with an element on the GUI (18) of the portable application presented on the display of the client processing device.

Presenting visual feedback on user actions is in this embodiment also done using elements in the GUI of the display of the client operating device.

In this embodiment, the advantage of zero footprint is partly realized by the portable application in the sense that no software is installed on or copied to the client operating device, but there is a configuration change needed to connect the transmitter of the client operating device with the base node, which needs to be undone afterwards.

Optionally, the portable application can make the configuration changes to the transmitter for the user in the background.

Advantages lost in this embodiment

- Partial loss of zero footprint nature of portable application
- More complex first user interaction
- More expertise required from user
- GUI needed on client operating device display, which is possibly also shown on central display
- Need to find free key on client operating device when using physical key for second user action
- Network interface is blocked from other uses by portable application

Optionally, the last point can be avoided by using the base unit as a gateway to the network that the client operating device wanted to connect to through its own interface.

Advantages are:

- tight control of user connectivity to corporate network through settings on the base unit
- keep network connectivity intact even when transmitter is now also used for display purposes

Disadvantage is a higher vulnerability of the system because the display connection is now possible a doorway into the corporate network.

What remains as advantages are

- the availability of a physical medium to distribute the portable application to users - no need to install or copy software to client operating device
- easy way to maintain software updates on the connection units (here: memory sticks) via the base unit
- possibility to write configuration data on the connection unit by the base unit, for example in the form of a configuration profile that can be read and used by the client operating device

Fourth Embodiment: Software only client installed on the client processing device.

This embodiment is similar to the third embodiment, with as only difference that the software is copied on the client operating device (figure 9). In this case, no plug and play port such as a USB port is required on the client operating device.

This embodiment will typically be used for tablet PC's and mobile devices. In that case

- there is often no USB port available
- application distribution is easy and widely accepted through application stores

Fifth embodiment: Base node software OEM'ed to projector or display equipment

In this embodiment, the base node is not realized as a separate physical box, but integrated into the processing unit inside a display or projector. All other details are as previously described.

Sixth embodiment

In this embodiment, the base node is not realized as a separate physical box, but integrated into the codec of a video conferencing equipment. All other details are as previously described. Seventh embodiment: Remote meeting participant

In this embodiment, one or multiple client operating devices are not in the direct vicinity of the base node but on a remote location. To accommodate this case, the following adaptations are needed:

- further compression and or scaling of the arbitrary media content to allow use of low bandwidth connection
- possibility to communicate connection parameters of the base node to a remote user
- connectivity of the base node to the WAN network to which the remote user is

connected

All other details are as previously described.

Eighth embodiment: multiple base nodes

In this embodiment, multiple base nodes are used. This can be done for different purposes:

- connectivity of multiple central displays
- extension of real estate of central display
- connectivity of base nodes in different remote locations

This provides the advantage that one can present on multiple base units from a single peripheral device. This is useful for a number of cases:

- personal peripheral device: user can have a personal peripheral device that is paired with multiple meeting rooms that he regularly uses
- use in meeting room with multiple base units each controlling a different display in the same meeting room

The proposal uses a special variant of the peripheral device called a multi base peripheral device. The multi base peripheral device is equipped with a rotating wheel around the circular central "show me" button. This could be a mechanical rotating multi-position switch or something like the touch wheel on the iPod classic.

The pairing of this multi-base variant of the peripheral device:

- the rotation wheel is put in the position of the corresponding base unit.
- the peripheral device is paired to the base node in the regular way
- the configuration parameters are stored in a permanent storage location; every position of the rotating wheel has a corresponding set of connection parameters (e.g. different rows in a table) each corresponding with a particular base

The connection of the peripheral device is as follows:

- multi-base peripheral device X is plugged into a PC
- rotation wheel on peripheral device X is put in position A
- peripheral device X reads configuration parameters in position A of its internal

memory
- peripheral device X connects to base node A
- base node A indicates connection of multi-base peripheral device X on central display screen
- rotation wheel on peripheral device X is put in position B
- peripheral device X reads configuration parameters in position B of its internal memory
- peripheral device X connects to base node B
- base node B indicates connection of multi-base peripheral device X on screen
- continue until correct base is selected with rotation wheel
- click the peripheral device input device e.g. button to show content on central display of base node
- rotating the wheel always first clicks away content from the base of the last position

Ninth embodiment

Fig. 10 shows a peripheral device 47 in accordance with an independent embodiment of the present invention including an input device. This embodiment can be used with any of the embodiments described above. The peripheral device is configured as a connection unit and is a physical device in the form of a connector for a plug and play interface of a user processing device as a host computer such as a USB connection, a flexible data and power connection connected to the connector and a base, the base having an actuator, e.g. a button configured to be an input device with the functions as described above.

The base and/or the actuator is preferably large in size, e.g. having a surface area between 100 and 14,400 square mm. The base can be square, rectangular, round, hexagonal, oval, polygonal in shape or any other ergonomically suitable shape. The actuator is preferably round but can be square, rectangular, hexagonal, oval, polygonal in shape etc. there can be more than one actuator on one base.

The length of the flexible data and power connection, e.g. cable is preferably adapted to place the peripheral device (when in its connected in its operating position), especially the base and the actuator, in the region between the boundary of the connected user processing device and the ergonomic boundary as defined above. In addition the flexible data and power connection should be adapted so that the base lies flat on the meeting table independent of the orientation of the connector needed to insert the connector into the plug and play interface.

The base preferably includes electronics such as having permanent storage for storing the portable application and the network configuration parameters, memory, a processing engine (e.g. CPU, FPGA), a wireless transmitter/receiver such as for WiFi or LiFi, a plug and play interface such as a USB interface, a LED ring as visual indicator. The visual indicator can be used for the LiFi interface. The portable application can be stored on the peripheral device, i.e. in the base. The visual indicator is for allowing user feedback from the connection unit of the status of any activity.

Some examples for activation of the actuator which can be used with any of the embodiments of the present invention:

- Sound activated (hand clap, voice recognition, computer sound, music, ...)
- Remote controlled via wireless connected device (IR, Bluetooth, WiFi, ...)
- Light activated
- Pressure activated, e.g. depression with a finger or hand,
- Touch activated
- Proximity ('near-touch' on the actuator or bringing the actuator close to some object
- Biometric reader such as Fingerprint reader, Iris scanner, DNA analyser
- Keypad, e.g. for entering Keycode e.g. a password

Alternative embodiments

In the above embodiments, once the connection is made between the connection device and a host computer, the peripheral device goes into connected mode. This means that there is at least one channel from the peripheral device to the base node. In accordance with any of the embodiments of the present invention a plurality of channels can be set up between the connection device and the base node. These channels may be logical channels.

Some examples for such a multichannel arrangement may include the first and one or more of the additional channels:

o First channel is for the Scraped image stream (XDS)

o Second channel is for GPU commands (OpenGL, DirectX)

o Third channel is for Mouse pointer coordinates (absolute, relative) o Fourth channel is for Mouse pointer icons

o Fifth channel is for Image data files (JPEG, PNG, GIF, ...)

o Sixth channel is for Multimedia data files or streams (MPEG2, MPEG4, OGG, H.26x, ...)

o Seventh channel is for Audio data files or streams (MP3, MP4, AAC, WMA, ...)

o Eighth channel is for text or Document data files (DOC, DOCX, PPT, PPTX, ODT, ODS, PDF, ...)

o Ninth channel is for transmission of a priority value 1 ,2, 3... as described above.

In the above embodiments, a particular method of pairing the peripheral device with the base node has been described. Any of the embodiments of the present invention may include other pairing mechanisms of which some examples are given below.

-Some examples for pairing

o Plug in the peripheral device, to a generic peripheral device port such as a USB port of the base node or other USB enabled device. Pairing info is transmitted over the generic peripheral interface such as USB.

o The Signal strength of the wireless channel to the base node is used to identify which base nod is to be used

o The Signal strength of the wireless channel or any other channel. Example is an NFC/RFID transmitter can be provided underneath the meeting room table. Putting the user processing device such as a laptop and the peripheral device plugged in on this table automatically pairs the peripheral device with the base of this meeting room

o Manual pairing (e.g. by entering IP address, hostname, wireless ID (like SSID on WiFi)).

Abstract

An electronic meeting tool and method for communicating arbitrary media content from users at a meeting includes a node configuration adapted to operate a display node of a communications network, the display node being coupled to a first display. The node configuration is adapted to receive user selected arbitrary media content and to control display of the user selected arbitrary media content on the first display. A peripheral device adapted to communicate the user selected arbitrary media content via the communications network is a connection unit including a connector adapted to couple to a port of a processing device having a second display, a memory and an operating system, and a transmitter. A program is adapted to obtain user selected arbitrary media content, the program leaving a zero footprint on termination. The user may trigger a transfer of the user selected arbitrary media content to the transmitter.

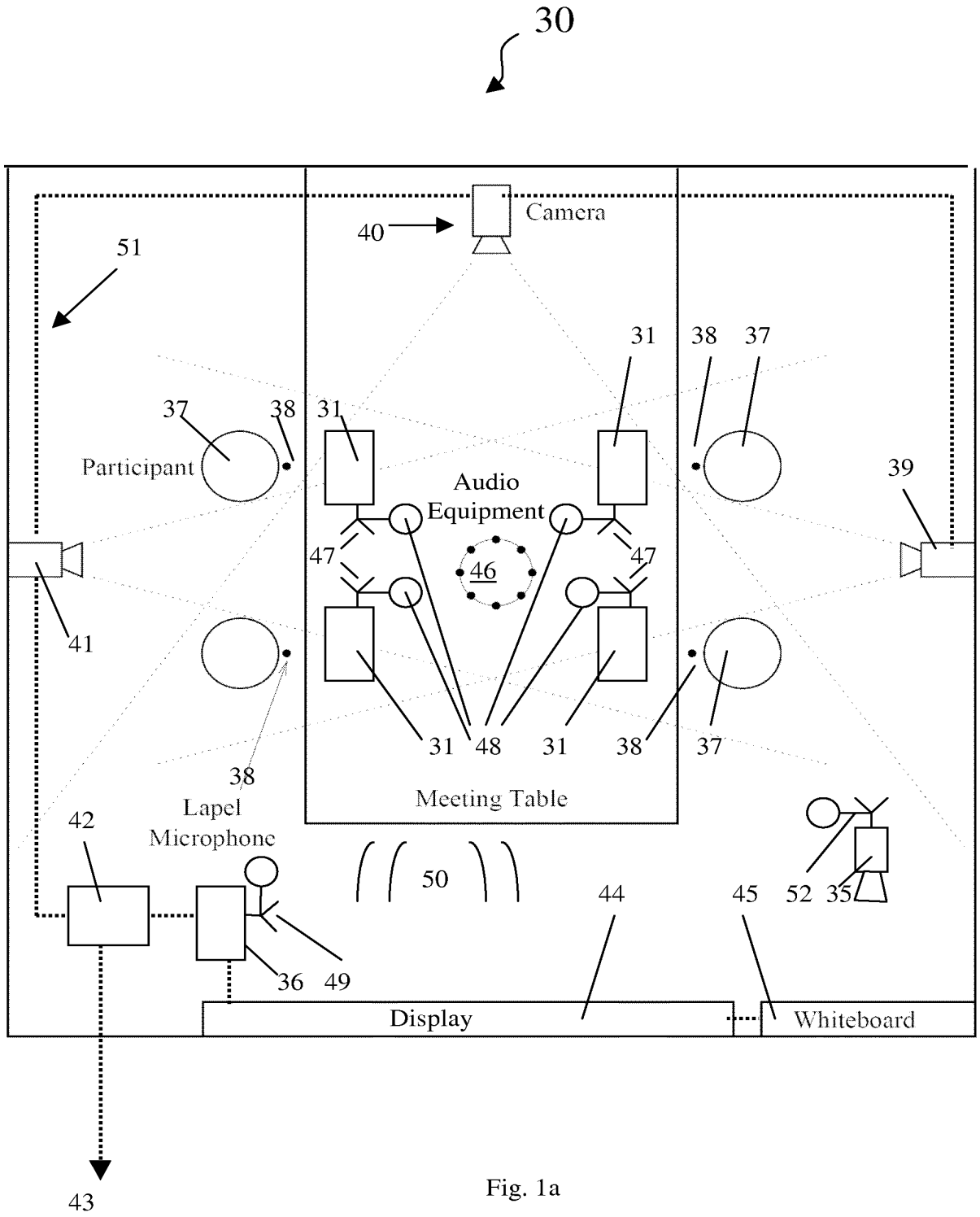

30
Camera
40
51
31
38
37
37
38
31
Participant
39
Audio
Equipment
47
47
46
41
31
48
31
38
37
38
Lapel
Microphone
Meeting Table
42
50
44
45
52
35
36
49
Display
Whiteboard
43

Fig. 1a

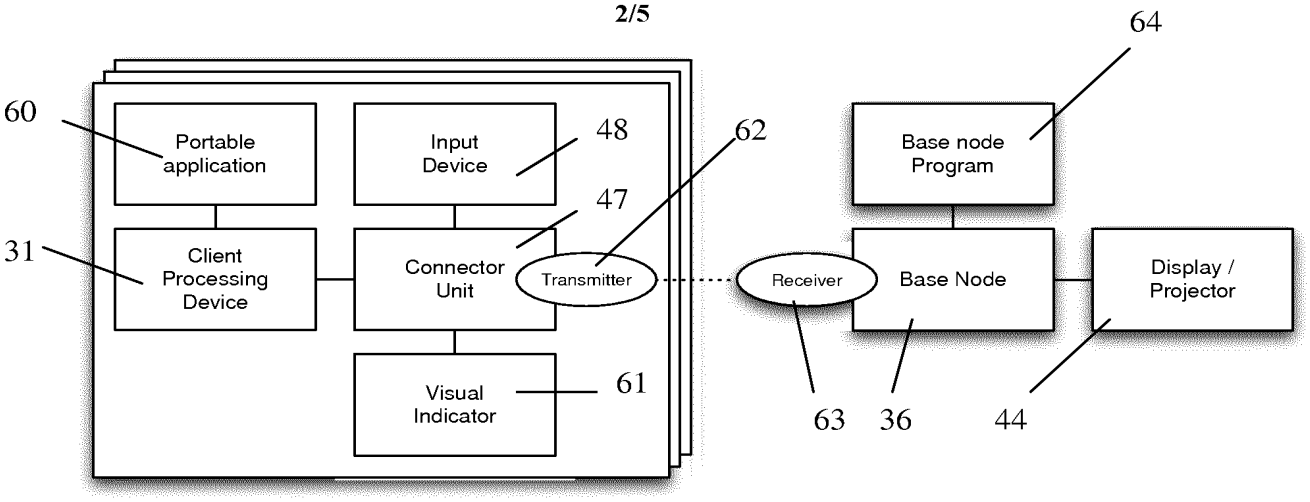

60
Portable application
Input Device
48
62
64
Base node Program
47
31
Client Processing Device
Connector Unit
Transmitter
Receiver
Base Node
Display / Projector
Visual Indicator
61
63
36
44

Fig. 1b

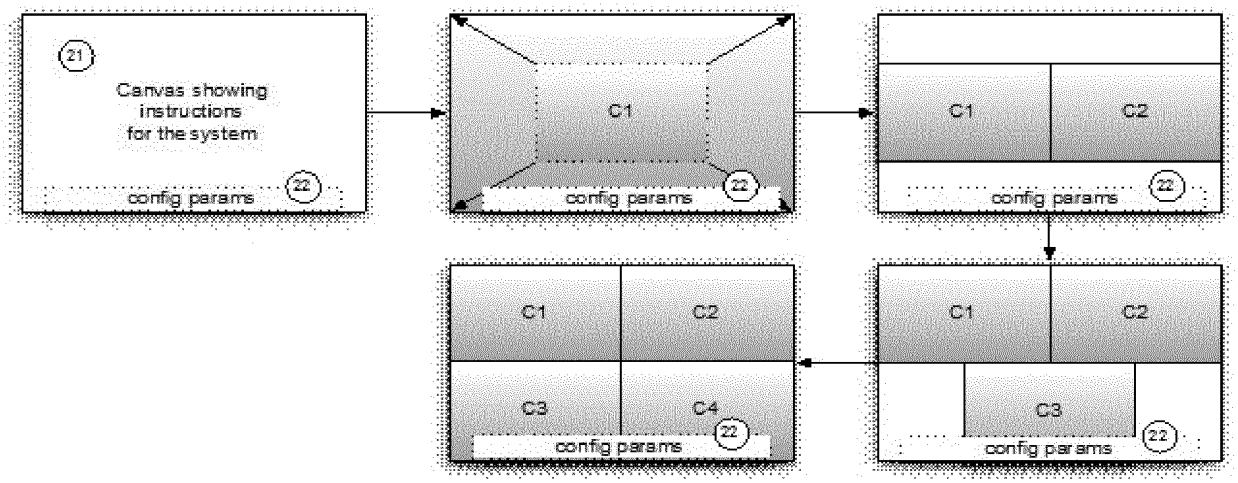

21
Canvas showing instructions for the system
config params
22
C1
C2
C3
C4

Fig. 2

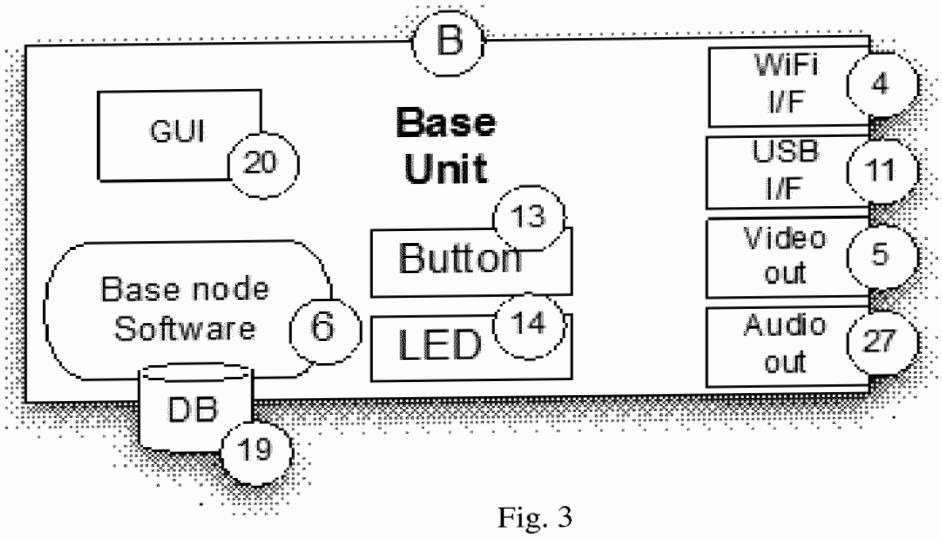


Fig. 3

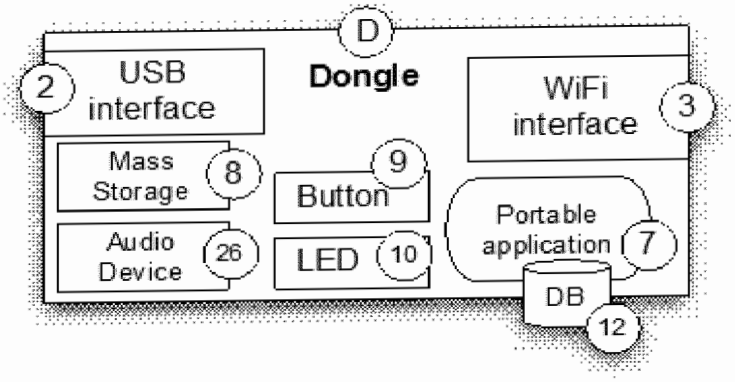


Fig. 4

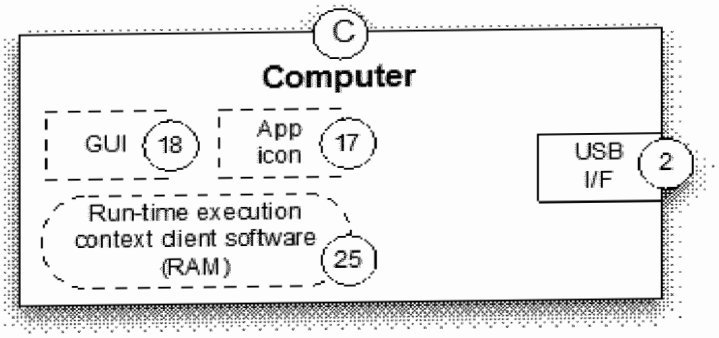


Fig. 5

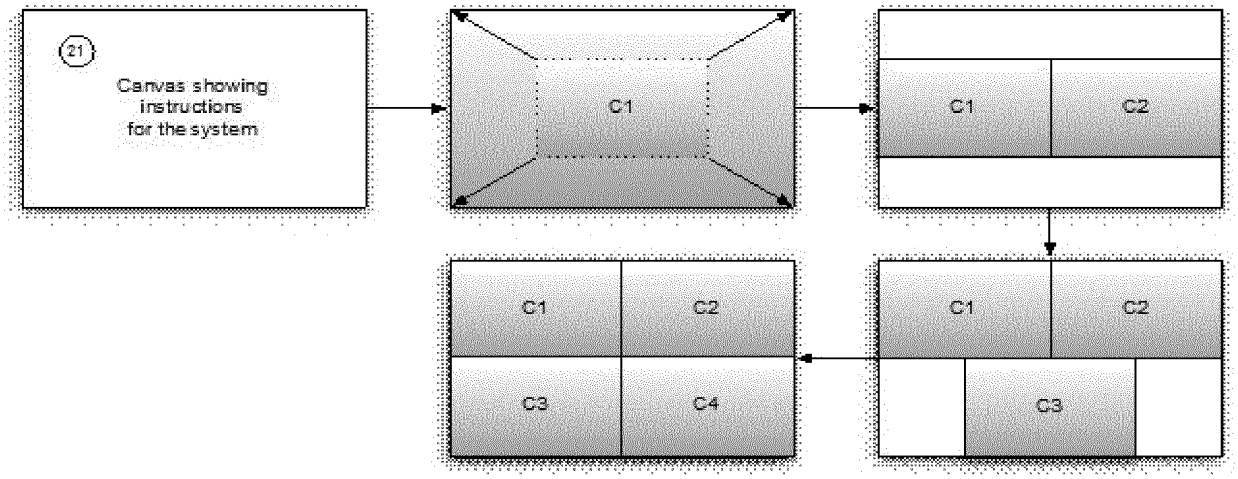


Fig. 6

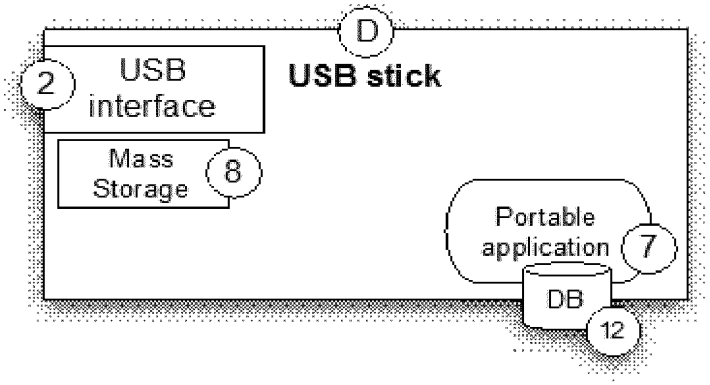


Fig.7

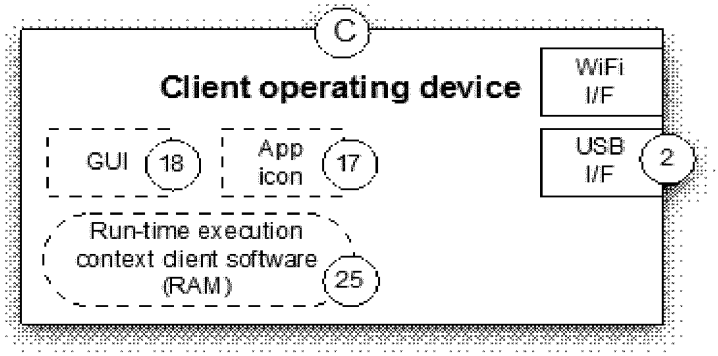


Fig. 8

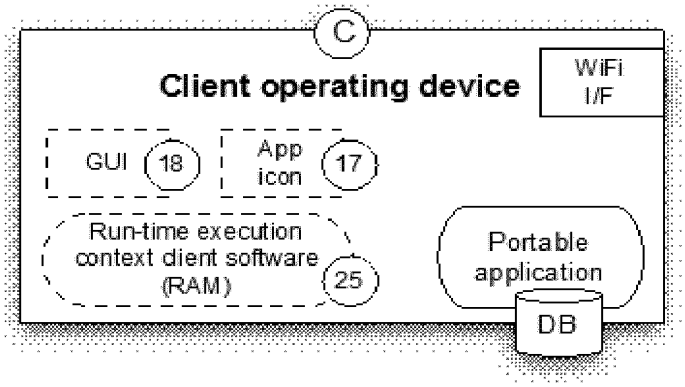

C
Client operating device
WiFi
I/F
GUI
18
App
icon
17
Run-time execution
context client software
(RAM)
25
Portable
application
DB

Fig. 9

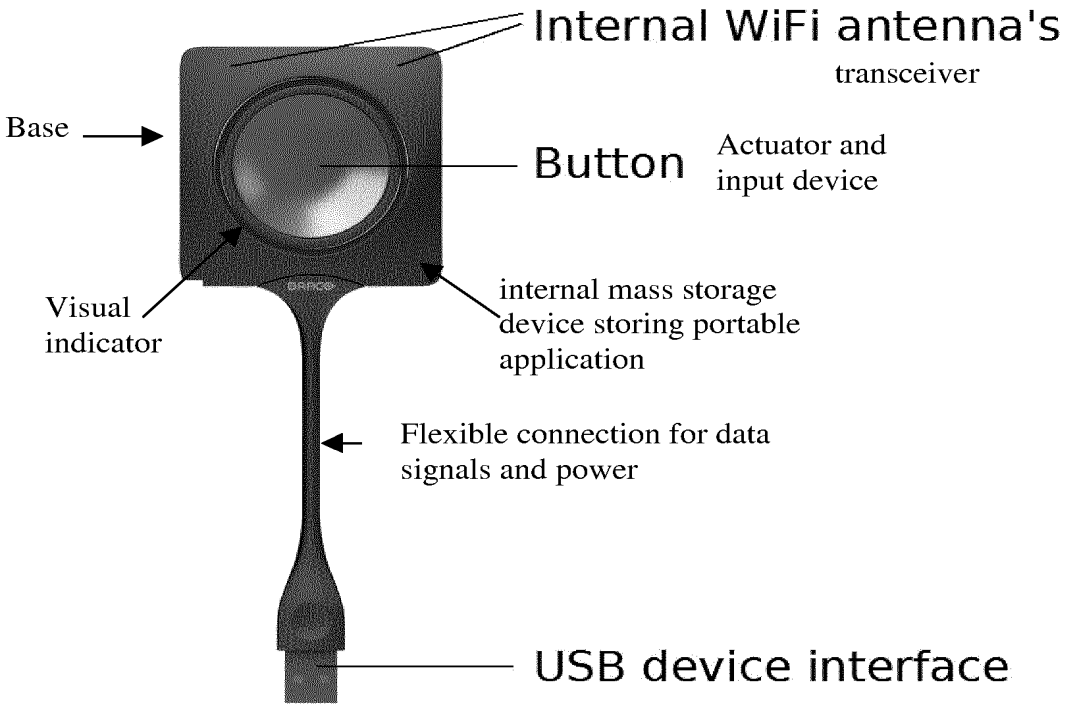

Internal WiFi antenna's
transceiver
Base
Button
Actuator and
input device
Visual
indicator
internal mass storage
device storing portable
application
Flexible connection for data
signals and power
USB device interface

Fig. 10

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	ELECTRONIC TOOL AND METHODS FOR MEETINGS
First Named Inventor/Applicant Name:	Koen Simon Herman BEEL
Filer:	Thomas Lee/Shelly Darrenkamp
Attorney Docket Number:	BEEL3002CIPC2/TL

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	320	320
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**320**

Electronic Acknowledgement Receipt

EFS ID:	41386171
Application Number:	17121919
International Application Number:	
Confirmation Number:	2764
Title of Invention:	ELECTRONIC TOOL AND METHODS FOR MEETINGS
First Named Inventor/Applicant Name:	Koen Simon Herman BEEL
Customer Number:	23364
Filer:	Thomas Lee/Shelly Darrenkamp
Filer Authorized By:	Thomas Lee
Attorney Docket Number:	BEEL3002CIPC2/TL
Receipt Date:	15-DEC-2020
Filing Date:	
Time Stamp:	11:10:08
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$320
RAM confirmation Number	E2020BEB10246156
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	BEEL3002CIPC2_app_trans.pdf	286335 5d2a7e52ec271914cd180871697181ba9ec68a6a	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	BEEL3002CIPC2_fee_trans.pdf	259871 a413f29a4f9a03d634750dec28431da34588209d	no	2
Warnings:					
Information:					
3	Application Data Sheet	BEEL3002CIPC2_ADS_15DEC20.pdf	1256815 805f2d38c21f7cfc164359c2663fc9878d35d332	no	10
Warnings:					
Information:					
4	Power of Attorney	GENERAL_POA_BARCO.pdf	158558 28c4f1a66fb792dec0424ac70f226a829279744a	no	1
Warnings:					
Information:					
5	Oath or Declaration filed	BEEL3002CIP_Dec_Assign.pdf	387282 7f6ad33abd922377c9a5af14289fb7c09ad34c19	no	3
Warnings:					
Information:					
6		BEEL3002CIPC2_Spec.pdf	281873 f4fd5f64135ba0bc3dbc61eef1fc6160184eb91c	yes	55
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	

	Specification		1		54
	Abstract		55		55
Warnings:					
Information:					
7	Drawings-only black and white line drawings	BEEL3002CIPC_Drawings_parent.pdf	566771 a43e4e07b48028f3511802a39e78453b3f445fe9	no	5
Warnings:					
Information:					
8	Fee Worksheet (SB06)	fee-info.pdf	29692 fda9d570f47353fcebd7edc45f50aeb9a3746602	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	3227197		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/15 (10-17)
Approved for use through 11/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995 no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	BEEL3002CIPC2/TL
First Named Inventor	Koen Simon Herman BEEL
Title	ELECTRONIC TOOL AND METHODS FOR MEETINGS
Priority Mail Express® Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. [✔] **Fee Transmittal Form** (PTO/SB/17 or equivalent)
2. [ ] **Applicant asserts small entity status.** See 37 CFR 1.27
3. [ ] **Applicant certifies micro entity status.** See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
4. [✔] **Specification** [*Total Pages* 55] Both the claims and abstract must start on a new page. *(See MPEP § 608.01(a) for information on the preferred arrangement)*
5. [✔] **Drawing(s)** (35 U.S.C. 113) [*Total Sheets* 5]
6. **Inventor's Oath or Declaration** [*Total Pages* 3] *(including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e))*
   a. [ ] Newly executed (original or copy)
   b. [✔] A copy from a prior application (37 CFR 1.63(d))
7. [✔] **Application Data Sheet** ** See note below.* See 37 CFR 1.76 (PTO/AIA/14 or equivalent)
8. **CD-ROM or CD-R** in duplicate, large table, or Computer Program (*Appendix*)
   [ ] Landscape Table on CD
9. **Nucleotide and/or Amino Acid Sequence Submission** (*if applicable, items a. – c. are required*)
   a. [ ] Computer Readable Form (CRF)
   b. [ ] Specification Sequence Listing on:
      i. [ ] CD-ROM or CD-R (2 copies); or
      ii. [ ] Paper
   c. [ ] Statements verifying identity of above copies

ADDRESS TO: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**

ACCOMPANYING APPLICATION PAPERS

10. [ ] **Assignment Papers** (cover sheet & document(s)) Name of Assignee _____
11. [ ] **37 CFR 3.73(c) Statement** (*when there is an assignee*) [✔] **Power of Attorney**
12. [ ] **English Translation Document** (*if applicable*)
13. [ ] **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
    [ ] Copies of citations attached
14. [ ] **Preliminary Amendment**
15. [ ] **Return Receipt Postcard** (*MPEP § 503*) (*Should be specifically itemized*)
16. [ ] **Certified Copy of Priority Document(s)** (*if foreign priority is claimed*)
17. [ ] **Nonpublication Request** Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
18. [ ] **Other:** _____

Note*: (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 **must be included in an Application Data Sheet (ADS).
(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

19. CORRESPONDENCE ADDRESS

[✔] The address associated with Customer Number: 23364 **OR** [ ] Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone		Email	

Signature	/Thomas Lee/	Date	December 15, 2020
Name (Print/Type)	THOMAS LEE	Registration No. (Attorney/Agent)	66396

This collection of information is required by 37 CFR 1.53(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/SB/17 (10-20)
Approved for use through 12/31/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995 no persons are required to respond to a collection of information unless it displays a valid OMB control number

FEE TRANSMITTAL

Complete if known	
Application Number	
Filing Date	December 15, 2020
First Named Inventor	Koen Simon Herman BEEL
Examiner Name	TBD
Art Unit	TBD
Practitioner Docket No.	BEEL3002CIPC2/TL

☐ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29. Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

TOTAL AMOUNT OF PAYMENT ($) 320

METHOD OF PAYMENT (check all that apply)

☐ Check ■ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

■ Deposit Account Deposit Account Number: 02-0200 Deposit Account Name: _____

For the above-identified deposit account, the Director is hereby authorized to (check all that apply):

■ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, **except for the filing fee**

☐ Charge any additional fee(s) or underpayment of fee(s) under 37 CFR 1.16 and 1.17 ☐ Credit any overpayment of fee(s)

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES (U = undiscounted fee; S = small entity fee; M = micro entity fee)

	FILING FEES			SEARCH FEES			EXAMINATION FEES			
Application Type	**U ($)**	**S ($)**	**M ($)**	**U ($)**	**S ($)**	**M ($)**	**U ($)**	**S ($)**	**M ($)**	**Fees Paid ($)**
Utility	320	160*	80	700	350	175	800	400	200	320
Design	220	110	55	160	80	40	640	320	160	
Plant	220	110	55	440	220	110	660	330	165	
Reissue	320	160	80	700	350	175	2,320	1,160	580	
Provisional	300	150	75	0	0	0	0	0	0	

* The $160 small entity status filing fee for a utility application is further reduced to $80 for a small entity status applicant who files the application via EFS-Web.

2. EXCESS CLAIM FEES

Fee Description	**Undiscounted Fee ($)**	**Small Entity Fee ($)**	**Micro Entity Fee ($)**
Each claim over 20 (including Reissues)	100	50	25
Each independent claim over 3 (including Reissues)	480	240	120
Multiple dependent claims	860	430	215

Total Claims		**Extra Claims**	**Fee ($)**		**Fee Paid ($)**
_____	-20 or HP =	_____ x	_____	=	_____

HP = highest number of total claims paid for, if greater than 20.

Indep. Claims		**Extra Claims**	**Fee ($)**		**Fee Paid ($)**
_____	-3 or HP =	_____ x	_____	=	_____

HP = highest number of independent claims paid for, if greater than 3.

Multiple Dependent Claims	
Fee ($)	**Fee Paid ($)**
_____	_____

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is $420 ($210 for small entity) ($105 for micro entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets		**Extra Sheets**		**Number of each additional 50 or fraction thereof**		**Fee ($)**		**Fee Paid ($)**
60	- 100 =	_____	/ 50 =	_____ (round **up** to a whole number)	x	_____	=	_____

4. OTHER FEE(S) **Fees Paid ($)**

Non-English specification, $140 fee ($70 for small entity) ($35 for micro entity) _____

Non-electronic filing fee under 37 CFR 1.16(t) for a utility application, $400 fee ($200 small or micro entity) _____

Other (e.g., late filing surcharge): _____ _____

SUBMITTED BY

Signature	/Thomas Lee/	Registration No. (Attorney/Agent) 66396	Telephone 703-683-0500
Name (Print/Type)	THOMAS LEE		Date December 15, 2020

This collection of information is required by 37 CFR 1.136. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

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The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	BEEL3002CIPC2/TL
	Application Number	
Title of Invention	ELECTRONIC TOOL AND METHODS FOR MEETINGS	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Koen Simon Herman		BEEL	

Residence Information (Select One) US Residency ● Non US Residency Active US Military Service

City	Eke	Country of Residence i	BE

Mailing Address of Inventor:

Address 1	Zandstraat 20a
Address 2	

City	Eke	State/Province	
Postal Code	B-9810	Country i	BE

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Yoav		NIR	

Residence Information (Select One) US Residency ◉ Non US Residency Active US Military Service

City	Komen	Country of Residence i	BE

Mailing Address of Inventor:

Address 1	rue de Ten Brielen 19
Address 2	

City	Komen	State/Province	
Postal Code	B-7780	Country i	BE

Inventor 3 Remove

Legal Name

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	BEEL3002CIPC2/TL
	Application Number	
Title of Invention	ELECTRONIC TOOL AND METHODS FOR MEETINGS	

Prefix	Given Name	Middle Name	Family Name	Suffix
	Filip	Josephine Johan	LOUWET	

Residence Information (Select One) US Residency ◉ Non US Residency Active US Military Service

City	Knesselare	Country of Residence [i]	BE

Mailing Address of Inventor:

Address 1	De Wijngaard 1		
Address 2			
City	Knesselare	State/Province	
Postal Code	B-9910	Country [i]	BE

Inventor 4 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Guy		COEN	

Residence Information (Select One) US Residency ◉ Non US Residency Active US Military Service

City	Aalst	Country of Residence [i]	BE

Mailing Address of Inventor:

Address 1	Louis Camustraat 25		
Address 2			
City	Aalst	State/Province	
Postal Code	B-9300	Country [i]	BE

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	23364		
Email Address	mail@baconthomas.com	Add Email	Remove Email

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	BEEL3002CIPC2/TL
	Application Number	
Title of Invention	ELECTRONIC TOOL AND METHODS FOR MEETINGS	

Application Information:

Title of the Invention	ELECTRONIC TOOL AND METHODS FOR MEETINGS		
Attorney Docket Number	BEEL3002CIPC2/TL	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	5	**Suggested Figure for Publication (if any)**	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	◯ Limited Recognition (37 CFR 11.9)
Customer Number	23364		

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	BEEL3002CIPC2/TL
	Application Number	
Title of Invention	ELECTRONIC TOOL AND METHODS FOR MEETINGS	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	14725401	2015-05-29
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
14725401	Continuation of	14/212170	2014-03-14	9083769	2015-07-14

Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
14/212170	Continuation in part of	13/270659	2011-10-11	8756348	2014-06-17

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
14/212170	Continuation in part of	PCT/EP2012/068166	2012-09-14
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13/270659	Claims benefit of provisional	61/534592	2011-09-14
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/EP2012/068166	Claims benefit of provisional	61/635219	2012-04-18
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/EP2012/068166	Claims benefit of provisional	61/534592	2011-09-14
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/EP2012/068166	Continuation in part of	13/270659	2011-10-11

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	BEEL3002CIPC2/TL
	Application Number	
Title of Invention	ELECTRONIC TOOL AND METHODS FOR MEETINGS	

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	BEEL3002CIPC2/TL
	Application Number	
Title of Invention	ELECTRONIC TOOL AND METHODS FOR MEETINGS	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	BEEL3002CIPC2/TL
	Application Number	
Title of Invention	ELECTRONIC TOOL AND METHODS FOR MEETINGS	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 — Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	BARCO N.V.		
Mailing Address Information For Applicant:			
Address 1	PRESIDENT KENNEDYPARK 35		
Address 2			
City	Kortrijk	**State/Province**	
Country	BE	Postal Code	B-8500
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	BEEL3002CIPC2/TL
	Application Number	
Title of Invention	ELECTRONIC TOOL AND METHODS FOR MEETINGS	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☒

Organization Name	BARCO N.V.

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1	PRESIDENT KENNEDYPARK 35		
Address 2			
City	Kortrijk	**State/Province**	
Country i	BE	Postal Code	B-8500
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Thomas Lee/			Date (YYYY-MM-DD)	2020-12-15
First Name	THOMAS	Last Name	LEE	Registration Number	66396

Additional Signature may be generated within this form by selecting the Add button. Add

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	BEEL3002CIPC2/TL
	Application Number	
Title of Invention	ELECTRONIC TOOL AND METHODS FOR MEETINGS	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

(19)中华人民共和国国家知识产权局

(12)发明专利申请

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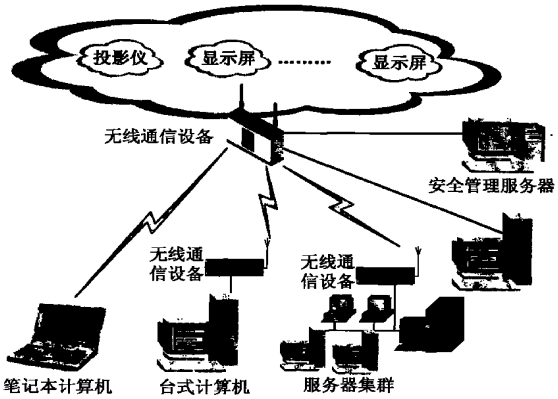
权利要求书 4 页 说明书 7 页 附图 9 页

(54)发明名称

一种保障安全性的电力调度云会商方法和装置

(57)摘要

本发明提出了一种保障安全性的电力调度云会商方法和装置，综合应用云计算、云会商、安全性、无阻塞性、高清晰视频会商及无线通信网络等技术，提供了一种保障安全性的电力调度云会商方法和装置。本发明通过随机服务排队论数学方法及6类优先级队列规则实现电力调度消息流事件的无阻塞性，通过集成物理防护、逻辑防护和安全管理措施实现安全性约束，通过高速通信网络实现显示1080p(20CIF)的高清晰视频流和幻灯图像。达到由投影仪和各类显示屏等构成的云端设备的资源共享，完成构筑保障安全性的电力调度动态云会商系统。服务于智能电网，促进智能调度全景可视化的发展。



CN 101917402 A

1. 一种保障安全性的电力调度云会商方法，其特征在于包括以下步骤：

(1) 保障安全性

S2.1 物理防护：用户安全认证卡、无线设备发射功率控制、定向波束天线、用多台无线设备同频干扰器搭建防护隔离边界；

S2.2 逻辑防护：IP 地址和 MAC 地址关联认证、加密、数字签名；

S2.3 安全管理措施：监视、控制、灾备、紧急情况服务；

(2) 无阻塞

S3.1 参会人员注册登记：参加电力调度云会商的人员注册登记，包括姓名、单位、部门、职务、IP 地址、MAC 地址、提交议题及内容；

S3.2 是否有主持人，若无则 S3.3 进入发言者自助模式，若有则 S3.10 进入主持人会商模式；

S3.3 发言者自助模式；

S3.4 是否有主持人模式请求，若无则 S3.5，若有则 S3.10 进入主持人会商模式；

S3.5 优先级规则选取；

S3.6 是否有优先级规则转换，若无则 S3.7，若有则 S3.5；

S3.7 依据优先级规则确定发言者及其顺序；

S3.8 发言者使用云会商，发出高清晰会议电视流，上送至显示云端；

S3.9 是否完毕或有人要求中断，若无则 S3.7，若有则 S3.4；

S3.10 主持人会商模式；

S3.11 主持人是否宣布结束，若否则 S3.12，若是则结束；

S3.12 主持人是否指定使用，若否则 S3.13，若是则 S3.15；

S3.13 发言者申请；

S3.14 主持人确认是否认可，若否则 S3.13，若是则 S3.15；

S3.15 发言者使用云会商，发出高清晰会议电视流，上送至显示云端；

S3.16 是否完毕或有人要求中断，若无则 S3.15，若有则 S3.11；

(3) 显高清

对应会商展示每路 720p 以上质量的高清晰会议电视流，包括以下 2 步骤：

构筑 IP 网络：有线和 / 或无线传输通道构成的网络的全双工带宽不小于 33Mbps；

展示高清：包括投影仪和显示屏在内的会商展示设备支持 720p 以上质量的高清晰会议电视。

2. 如权利要求 1 所述的方法，其特征在于步骤 S3.5 优先级规则包括以下 6 类：

其一，按照参会人员注册登记的提交议题及内容，重要性由大到小，确定优先级队列；

其二，按照参会人员注册登记的申请时间顺序，利用排队论离散时间随机过程 {Xi} 所具有 Markov 性质，确定优先级队列；

其三，按照参会人员注册登记的单位序列，确定优先级队列；

其四，按照参会人员注册登记的部门专业序列，确定优先级队列；

其五，按照参会人员注册登记的职务和姓名序列，职务由大到小，同职务按照姓名字母顺序，确定优先级队列；

其六，当电力调度云会商过程中陆续有人员加入会商时，应用随机服务排队论数学方

法确定优先级队列规则为：应急事件后到先服务（LCFS）即M/M/c/LCFS模型，重要议题及内容带优先服务权（PR）即M/M/c/PR模型，次重要议题及内容随机服务（SIRO）即M/M/c/SIRO模型，剩余的一般性议题及内容集合内采用先到先服务（FCFS）即M/M/c/PR模型。

3. 如权利要求1或2所述的方法，其特征在于所述（2）无阻塞是根据电力调度智能化的云会商的随机服务特点，利用排队论数学方法，建立数学模型，包括：

设共有c个会商云幻灯，每个需要会商的云幻灯的平均服务率均为u，在正常情况下，电力调度消息流事件的平均到达率为 λ，则 Δt 时间内有一个电力调度消息流事件到达的概率为 $P_1 = \lambda \Delta t$，在 Δt 时间内有一个电力调度消息流事件离去的概率为 $q_1 = \lambda \Delta t$；

分以下三种情况：

（1）当无电力调度消息流事件时，三种互不相容事件的概率分别为：

（a）在时间t内没有电力调度消息流事件排队，Δt 时刻也没有电力调度消息流事件到达的概率为 $P_0(1-\lambda \Delta t)$；

（b）在时间t内有一个电力调度消息流事件，Δt 内没有电力调度消息流事件到达，但有一位电力调度消息流事件接受云会商后离去的概率为 $P_1(1-\lambda \Delta t)u\Delta t$；

（c）在时间t内没有电力调度消息流事件排队，但在 Δt 时刻内有一位电力调度消息流事件到达，也有一位电力调度消息流事件接受云会商后离去的概率为 $P_0\lambda \Delta tu\Delta t$；

则 $P_0 = P_0(1-\lambda \Delta t)+P_1(1-\lambda \Delta t)u\Delta t+P_0\lambda u(\Delta t)^2$

略去二阶小量，整理得 $P_1 = \lambda P_0/u$；

（2）当已有n个电力调度消息流事件，且 $1 \leqslant n < c$ 时，可分为以下四种情况：

（a）时间t内有n-1个电力调度消息流事件在排队，Δt 时刻内有一位电力调度消息流事件到达，但没有任何电力调度消息流事件被云会商的概率为 $P_{n-1}\lambda \Delta t(1-nu\Delta t)$；

（b）时间t内有n+1个电力调度消息流事件在排队，Δt 时刻内没有电力调度消息流事件到达，但有一位电力调度消息流事件接受云会商后离去的概率为 $P_{n+1}(1-\lambda \Delta t)[(n+1)u\Delta t]$；

（c）时间t内有n个电力调度消息流事件在排队，Δt 时刻内没有电力调度消息流事件到达，也没有任何电力调度消息流事件被云会商的概率为 $P_n(1-\lambda \Delta t)(1-nu\Delta t)$；

（d）时间t内有n个电力调度消息流事件在排队，Δt 时刻内有一个电力调度消息流事件到达，也有一位电力调度消息流事件接受云会商后离去的概率为 $P_n\lambda \Delta tnu\Delta t$；

（3）电力调度消息流事件数 $n \geqslant c$ 时，与情况（2）类似，但相应的概率分别为：

（a）$P_{n-1}(\lambda \Delta t)(1-c\mu \Delta t)$

（b）$P_{n+1}(1-\lambda \Delta t)(c\mu \Delta t)$

（c）$P_n(1-\lambda \Delta t)(1-c\mu \Delta t)$

（d）$P_n(\lambda \Delta t)c\mu \Delta t$

由上面的公式得到：

$$\begin{cases} P_{n-1}=\left(\dfrac{\lambda+c\mu}{c\mu}\right)P_n-\left(\dfrac{\lambda}{c\mu}\right)P_{n-1} \\ P=\dfrac{\left(\dfrac{\lambda}{\mu}\right)^n}{n!}\times P_0,\quad 1\le n<c \\ P_n=\dfrac{\left(\dfrac{\lambda}{\mu}\right)^n}{c!c^{n-c}}P_0,\quad n\ge c \end{cases}$$

解得系统的稳态概率为：

$$P_0=\frac{1}{\sum_{n=0}^{c-1}\dfrac{\left(\dfrac{\lambda}{\mu}\right)^n}{n!}+\dfrac{\left(\dfrac{\lambda}{\mu}\right)^c}{c!\left(1-\dfrac{\lambda}{\mu}\right)}}$$

只有当 λ/cμ ＜1时，才能使会商云幻灯服务系统达到稳态而不会排成无限的队列，会商云幻灯系统的服务强度为 $\rho=\dfrac{\lambda}{c\mu}$，即会商云幻灯系统的利用率；

会商云幻灯系统的服务率为：

$$\mu_n=\begin{cases} n\mu & n=1,2,3,\cdots,c \\ c\mu & n=c+1,c+2,\cdots. \end{cases}$$

即当系统中有n(n＜c)个电力调度消息流事件时，系统的服务率为nμ；当系统中有c个电力调度消息流事件时，系统的服务率达到最大值cμ；当系统中的电力调度消息流事件数超过c时，由于c个服务台都忙着，其余电力调度消息流事件必须排队，这时的服务率仍为cμ；

由此可得，

系统中的电力调度消息流事件排队长度为 $L_q=\dfrac{\lambda\mu\left(\dfrac{\lambda}{\mu}\right)^c P_0}{(c-1)!(c\mu-\lambda)^2}$，

电力调度消息流事件在系统中的平均等候时间为 $W_q=\dfrac{\mu\left(\dfrac{\lambda}{\mu}\right)^c P_0}{(c-1)!(c\mu-\lambda)^2}$

电力调度消息流事件在系统中的平均逗留时间 $W_S=W_q+\dfrac{1}{\mu}=\dfrac{(c\rho)^c\rho P_0}{c!(1-\rho)^2\lambda}+\dfrac{1}{\mu}$，

系统中的平均电力调度消息流事件数 $L_S=W_S\lambda=\dfrac{\lambda}{\mu}+\dfrac{(c\rho)^c\rho P_0}{c!(1-\rho)^2}$，

其中，定义参数为：

L_q：系统中的平均排队长度；

W_q :电力调度消息流事件在系统中的平均等候时间,每个电力调度消息流事件都希望这段时间越短越好 ;

W_S :电力调度消息流事件在系统中的平均逗留时间 ;

L_S :系统中的平均电力调度消息流事件数 ;

λ :平均到达率 ;

μ :平均服务率 ;

c :系统中并联会商云幻灯的数目 ;

ρ :服务强度,即每个会商云幻灯单位时间间隔内的平均服务时间 ;

P_0 :系统的稳态概率。

4. 一种使用权利要求 1-3 任一所述方法的装置,其特征包括以下 8 种 :

其一,步骤保障安全性和无阻塞的实现在安全管理服务器内实现 ;

其二,无线服务器支持 IEEE 802.11b/g 和 100M 局域网络接口,带有与 720p 以上质量的投影仪 / 显示屏连接的信号接口,并且内置 H.264 的软解压软件,支持 DHCP 服务器功能,可以自动为客户端电脑分配 IP 地址 ;

其三,参加电力调度云会商的电脑安装云会商客户端软件,该软件包括权利要求 1-2 的步骤和 H.264 的软编码软件 ;

其四,在有线局域网应用场景,计算机云会商群通过普通以太网交换机汇聚,在经过以太网线连接至无线服务器,无线服务器连接安全管理服务器和 720p 以上质量的投影仪 / 显示屏,完成电力调度会商的显示与展现“云”化,实现显示与展现的资源共享,并保障其安全性 ;

其五,在无线局域网应用场景,计算机云会商群通过其内置或外置的无线局域网卡,经过无线 IEEE 802.11b/g 协议,连接至无线服务器,无线服务器连接安全管理服务器和 720p 以上质量的投影仪 / 显示屏,完成电力调度会商的显示与展现“云”化,实现显示与展现的资源共享,并保障其安全性 ;

其六,在无线局域网和有线局域网组成的混合网应用场景,计算机云会商群通过有线或无线局域网卡,有线场景通过普通以太网交换机汇聚,连接至无线服务器,无线服务器连接安全管理服务器和 720p 以上质量的投影仪 / 显示屏,完成电力调度会商的显示与展现“云”化,实现显示与展现的资源共享,并保障其安全性 ;

其七,参加电力调度云会商的电脑可以是笔记本计算机、台式计算机或服务器集群 ;

其八,用多台同频干扰器搭建防护隔离边界,具体做法是 :使同频干扰器的无线覆盖半径小于无线服务器的无线覆盖半径,在电力调度云会商会场周界外 1 个同频干扰器的无线覆盖半径的边界周围,用多台同频干扰器搭建防护隔离边界,相邻同频干扰器的间距为 1 个同频干扰器的无线覆盖半径。

一种保障安全性的电力调度云会商方法和装置

技术领域

[0001] 本发明属于电力领域，服务于智能电网，具体涉及电力调度智能化领域，综合云计算、云会商、安全性、无阻塞性、高清晰视频会商及无线通信网络技术，提出了一种保障安全性的电力调度云会商方法和装置。

背景技术

[0002] 云计算是一个比较热的新名词，资源池称为“云”，云的规模可以动态伸缩，它的边界是模糊的；云在空中飘忽不定，无法也无需确定它的具体位置，但它确实存在于某处。“云”是一些可以自我维护和管理的虚拟计算资源，通常为一些大型服务器集群，包括计算服务器、存储服务器、宽带资源等等。云计算将所有的计算资源集中起来，并由软件实现自动管理，无需人为参与。云计算 (Cloud Computing) 是并行计算 (Parallel Computing)、分布式计算 (Distributed Computing) 和网格计算 (Grid Computing) 的发展，或者说是这些计算机科学概念的商业实现。云计算是虚拟化 (Virtualization)、效用计算 (Utility Computing)、IaaS(基础设施即服务)、PaaS(平台即服务)、SaaS(软件即服务) 等概念混合演进并跃升的结果。当今流行的典型云计算解决方案包括 Google 云计算、Amazon 云计算、Salesforce 云计算、云安全等。

[0003] 基于自助服务的使用模型为用户提供了按需上传、构建、部署、调度、管理以及报告业务服务的能力。同时，给用户提供的自助服务越多，必要的运维管理活动就越少。基于该种云计算的理念，在电力调度会商全景可视化过程中，将显示展现“云”化，并结合安全性约束，本发明提出了一种保障安全性的电力调度云会商方法和装置。建设智能电网是国际电力工业积极应对未来挑战的共同选择，电力调度是智能电网的重要环节。在电力调度智能化的过程中，对电力调度会商的全景可视化要求越来越高。本发明的目的是实现电力调度会商的显示与展现“云”化，实现显示与展现的资源共享，并保障其安全性。

[0004] 目前的电力调度会商系统虽然有语音会商系统、视频会商系统和网真会商系统等多种形式，但存在以下 6 点不足。其一，必须在特定的会商室才能实现语音、视频或网真会商；其二，会商的显示与展现设备要么闲置、要么同时挣抢使用，要实现显示与展现资源共享的需求突出；其三，若发言者需要展现个人笔记本电脑内的信息，则拔插投影仪线 / 显示屏线非常麻烦，且电脑、投影仪 / 显示屏的信号插头 / 座及其电缆易出故障，影响会商进程；其四，无法在保障安全性的前提下混合使用有线和无线会商技术；其五，无法实现发言者自助模式，而且在电力调度会商过程中陆续有人员加入的情况下更无法实现发言者自助模式；其六，无法实现在电力调度会商过程中同时兼顾 2 种模式，即发言者自助模式和主持人模式。本发明的方法和装置能够克服以上 6 点不足，其一，具有发明的装置、投影仪 / 显示屏和电脑，不强求装备齐全的会商室，在通常的会议室，即可实现保障安全性的电力调度云会商；其二，达到由投影仪和各类显示屏等构成的云端设备的资源共享；其三，电力调度云会商流通过无线或 / 和有线局域网，用局域网线与发言者电脑连接即可；其四，电力调度云会商流可以通过无线局域网或有线局域网，也以通过无线局域网和有线局域网组成的混合

网，在保障安全性的前提下实现电力调度云会商；其五，能够实现发言者自助模式，而且在电力调度会商过程中陆续有人员加入的情况下也能实现发言者自助模式；其六，能够实现在电力调度会商过程中同时兼顾 2 种模式，即发言者自助模式和主持人模式。

发明内容

[0005] 本发明借助于云计算的理念，服务于智能电网，促进智能调度全景可视化的发展，以实现显示与展现的资源共享为目标。本发明提出了云会商 (Cloud Dynamic Consultation) 的概念，综合应用云计算、云会商、安全性、无阻塞性、高清晰视频会商及无线通信网络等技术，提交了一种保障安全性的电力调度云会商方法和装置。并给出了本发明的具体实施方式范例——保障安全性的电力调度动态云会商系统。

[0006] 本发明通过随机服务排队论数学方法实现电力调度消息流事件的无阻塞性，通过集成加密协议和认证协议实现安全性约束，通过高速通信网络实现显示 720p(9CIF) 和 1080p(20CIF) 的高清晰视频流和幻灯图像。达到由投影仪和各类显示屏等构成的云端设备的资源共享，完成构筑保障安全性的电力调度动态云会商系统。服务于智能电网，促进智能调度全景可视化的发展。

[0007] 本发明提出的一种保障安全性的电力调度云会商方法，其特征在于包括以下步骤：

[0008] (1) 保障安全性

[0009] S2.1 物理防护：用户安全认证卡、无线设备发射功率控制、定向波束天线、用多台无线设备同频干扰器搭建防护隔离边界；

[0010] S2.2 逻辑防护：IP 地址和 MAC 地址关联认证、加密、数字签名；

[0011] S2.3 安全管理措施：监视、控制、灾备、紧急情况服务；

[0012] (2) 无阻塞

[0013] S3.1 参会人员注册登记：参加电力调度云会商的人员注册登记，包括姓名、单位、部门、职务、IP 地址、MAC 地址、提交议题及内容；

[0014] S3.2 是否有主持人，若无则 S3.3 进入发言者自助模式，若有则 S3.10 进入主持人会商模式；

[0015] S3.3 发言者自助模式；

[0016] S3.4 是否有主持人模式请求，若无则 S3.5，若有则 S3.10 进入主持人会商模式；

[0017] S3.5 优先级规则选取；

[0018] S3.6 是否有优先级规则转换，若无则 S3.7，若有则 S3.5；

[0019] S3.7 依据优先级规则确定发言者及其顺序；

[0020] S3.8 发言者使用云会商，发出高清晰会议电视流，上送至显示云端；

[0021] S3.9 是否完毕或有人要求中断，若无则 S3.7，若有则 S3.4；

[0022] S3.10 主持人会商模式；

[0023] S3.11 主持人是否宣布结束，若否则 S3.12，若是则结束；

[0024] S3.12 主持人是否指定使用，若否则 S3.13，若是则 S3.15；

[0025] S3.13 发言者申请；

[0026] S3.14 主持人确认是否认可，若否则 S3.13，若是则 S3.15；

[0027] S3.15 发言者使用云会商，发出高清晰会议电视流，上送至显示云端；

[0028] S3.16 是否完毕或有人要求中断，若无则 S3.15，若有则 S3.11；

[0029] (3) 显高清

[0030] 对应会商展示每路 720p 以上质量的高清晰会议电视流，包括以下 2 步骤：

[0031] 构筑 IP 网络：有线和 / 或无线传输通道构成的网络的全双工带宽不小于 33Mbps；展示高清包括投影仪和显示屏在内的会商展示设备支持 720p 以上质量的高清晰会议电视；其中，步骤 S3.5 优先级规则包括以下 6 类：

[0032] 其一，按照参会人员注册登记的提交议题及内容，重要性由大到小，确定优先级队列；

[0033] 其二，按照参会人员注册登记的申请时间顺序，利用排队论离散时间随机过程 {Xi} 所具有 Markov 性质，确定优先级队列；

[0034] 其三，按照参会人员注册登记的单位序列，确定优先级队列；

[0035] 其四，按照参会人员注册登记的部门专业序列，确定优先级队列；

[0036] 其五，按照参会人员注册登记的职务和姓名序列，职务由大到小，同职务按照姓名字母顺序，确定优先级队列；

[0037] 其六，当电力调度云会商过程中陆续有人员加入会商时，应用随机服务排队论数学方法确定优先级队列规则为：应急事件后到先服务 (LCFS) 即 M/M/c/LCFS 模型，重要议题及内容带优先服务权 (PR) 即 M/M/c/PR 模型，次重要议题及内容随机服务 (SIRO) 即 M/M/c/SIRO 模型，剩余的一般性议题及内容集合内采用先到先服务 (FCFS) 即 M/M/c/PR 模型；

[0038] 其中，所述 (2) 无阻塞是根据电力调度智能化的云会商的随机服务特点，利用排队论数学方法，建立数学模型，包括：

[0039] 设共有 c 个会商云幻灯，每个需要会商的云幻灯的平均服务率均为 u，在正常情况下，电力调度消息流事件的平均到达率为 λ，则 Δt 时间内有一个电力调度消息流事件到达的概率为 $P_1 = \lambda \Delta t$，在 Δt 时间内有一个电力调度消息流事件离去的概率为 $q_1 = \lambda \Delta t$；

[0040] 分以下三种情况：

[0041] (4) 当无电力调度消息流事件时，三种互不相容事件的概率分别为：

[0042] (a) 在时间 t 内没有电力调度消息流事件排队，Δt 时刻也没有电力调度消息流事件到达的概率为 $P_0(1-\lambda \Delta t)$；

[0043] (b) 在时间 t 内有一个电力调度消息流事件，Δt 内没有电力调度消息流事件到达，但有一位电力调度消息流事件接受云会商后离去的概率为 $P_1(1-\lambda \Delta t)u\Delta t$；

[0044] (c) 在时间 t 内没有电力调度消息流事件排队，但在 Δt 时刻内有一位电力调度消息流事件到达，也有一位电力调度消息流事件接受云会商后离去的概率为 $P_0\lambda \Delta t u \Delta t$；

[0045] 则 $P_0 = P_0(1-\lambda \Delta t)+P_1(1-\lambda \Delta t)u\Delta t+P_0\lambda u(\Delta t)^2$

[0046] 略去二阶小量，整理得 $P_1 = \lambda P_0/u$；

[0047] (5) 当已有 n 个电力调度消息流事件，且 $1 \leqslant n < c$ 时，可分为以下四种情况：

[0048] (a) 时间 t 内有 n-1 个电力调度消息流事件在排队，Δt 时刻内有一位电力调度消息流事件到达，但没有任何电力调度消息流事件被云会商的概率为 $P_{n-1}\lambda \Delta t(1-nu\Delta t)$；

[0049] (b) 时间 t 内有 n+1 个电力调度消息流事件在排队，Δt 时刻内没有电力调度消

息流事件到达，但有一位电力调度消息流事件接受云会商后离去的概率为 $P_{n+1}(1-\lambda\Delta t)[(n+1)u\Delta t]$；

[0050] (c) 时间 t 内有 n 个电力调度消息流事件在排队，Δt 时刻内没有电力调度消息流事件到达，也没有任何电力调度消息流事件被云会商的概率为 $P_n(1-\lambda\Delta t)(1-nu\Delta t)$；

[0051] (d) 时间 t 内有 n 个电力调度消息流事件在排队，Δt 时刻内有一个电力调度消息流事件到达，也有一位电力调度消息流事件接受云会商后离去的概率为 $P_n\lambda\Delta tnu\Delta t$；

[0052] (6) 电力调度消息流事件数 $n \geq c$ 时，与情况 (2) 类似，但相应的概率分别为：

[0053] (a) $P_{n-1}(\lambda\Delta t)(1-c\mu\Delta t)$

[0054] (b) $P_{n+1}(1-\lambda\Delta t)(c\mu\Delta t)$

[0055] (c) $P_n(1-\lambda\Delta t)(1-c\mu\Delta t)$

[0056] (d) $P_n(\lambda\Delta t)c\mu\Delta t$

[0057] 由上面的公式得到：

[0058]
$$\begin{cases} P_{n-1}=\left(\dfrac{\lambda+c\mu}{c\mu}\right)P_n-\left(\dfrac{\lambda}{c\mu}\right)P_{n-1} \\ P=\dfrac{\left(\dfrac{\lambda}{\mu}\right)^n}{n!}\times P_0, \quad 1\leq n<c \\ P_n=\dfrac{\left(\dfrac{\lambda}{\mu}\right)^n}{c!c^{n-c}}P_0, \quad n\geq c \end{cases}$$

[0059] 解得系统的稳态概率为：

[0060]
$$P_0=\frac{1}{\sum_{n=0}^{c-1}\dfrac{\left(\dfrac{\lambda}{\mu}\right)^n}{n!}+\dfrac{\left(\dfrac{\lambda}{\mu}\right)^c}{c!\left(1-\dfrac{\lambda}{\mu}\right)}}$$

[0061] 只有当 $\lambda/c\mu<1$ 时，才能使会商云幻灯服务系统达到稳态而不会排成无限的队列，会商云幻灯系统的服务强度为 $\rho=\dfrac{\lambda}{c\mu}$，即会商云幻灯系统的利用率；

[0062] 会商云幻灯系统的服务率为：

[0063]
$$\mu_n=\begin{cases} n\mu & n=1,2,3,\cdots,c \\ c\mu & n=c+1,c+2,\cdots. \end{cases}$$

[0064] 即当系统中有 n(n < c) 个电力调度消息流事件时，系统的服务率为 nμ；当系统中有 c 个电力调度消息流事件时，系统的服务率达到最大值 cμ；当系统中的电力调度消息流事件数超过 c 时，由于 c 个服务台都忙着，其余电力调度消息流事件必须排队，这时的服务率仍为 cμ；由此可得，

[0065] 系统中的电力调度消息流事件排队长度为 $L_q = \frac{\lambda\mu\left(\frac{\lambda}{\mu}\right)^c P_0}{(c-1)!(c\mu-\lambda)^2}$，

[0066] 电力调度消息流事件在系统中的平均等候时间为 $W_q = \frac{\mu\left(\frac{\lambda}{\mu}\right)^c P_0}{(c-1)!(c\mu-\lambda)^2}$

[0067] 电力调度消息流事件在系统中的平均逗留时间 $W_S = W_q + \frac{1}{\mu} = \frac{(c\rho)^c \rho P_0}{c!(1-\rho)^2\lambda} + \frac{1}{\mu}$，

[0068] 系统中的平均电力调度消息流事件数 $L_S = W_S\lambda = \frac{\lambda}{\mu} + \frac{(c\rho)^c \rho P_0}{c!(1-\rho)^2}$，

[0069] 其中，定义参数为：

[0070] L_q：系统中的平均排队长度；

[0071] Wq：电力调度消息流事件在系统中的平均等候时间，每个电力调度消息流事件都希望这段时间越短越好；

[0072] W_S：电力调度消息流事件在系统中的平均逗留时间；

[0073] L_S：系统中的平均电力调度消息流事件数；

[0074] λ：平均到达率；

[0075] μ：平均服务率；

[0076] c：系统中并联会商云幻灯的数目；

[0077] ρ：服务强度，即每个会商云幻灯单位时间间隔内的平均服务时间；

[0078] P_0：系统的稳态概率。

[0079] 本发明还提出了使用上述方法的装置，其特征包括以下 8 种：

[0080] 其一，步骤保障安全性和无阻塞的实现在安全管理服务器内实现；

[0081] 其二，无线服务器支持 IEEE 802.11b/g 和 100M 局域网络接口，带有与 720p 以上质量的投影仪 / 显示屏连接的信号接口，并且内置 H.264 的软解压软件，支持 DHCP 服务器功能，可以自动为客户端电脑分配 IP 地址；

[0082] 其三，参加电力调度云会商的电脑安装云会商客户端软件，该软件包括权利要求 1-2 的步骤和 H.264 的软编码软件；

[0083] 其四，在有线局域网应用场景，计算机云会商群通过普通以太网交换机汇聚，在经过以太网线连接至无线服务器，无线服务器连接安全管理服务器和 720p 以上质量的投影仪 / 显示屏，完成电力调度会商的显示与展现“云”化，实现显示与展现的资源共享，并保障其安全性；

[0084] 其五，在无线局域网应用场景，计算机云会商群通过其内置或外置的无线局域网卡，经过无线 IEEE 802.11b/g 协议，连接至无线服务器，无线服务器连接安全管理服务器和 720p 以上质量的投影仪 / 显示屏，完成电力调度会商的显示与展现“云”化，实现显示与展现的资源共享，并保障其安全性；

[0085] 其六，在无线局域网和有线局域网组成的混合网应用场景，计算机云会商群通过有线或无线局域网卡，有线场景通过普通以太网交换机汇聚，连接至无线服务器，无线服务

器连接安全管理服务器和720p以上质量的投影仪/显示屏，完成电力调度会商的显示与展现“云”化，实现显示与展现的资源共享，并保障其安全性；

[0086] 其七，参加电力调度云会商的电脑可以是笔记本计算机、台式计算机或服务器集群；

[0087] 其八，用多台同频干扰器搭建防护隔离边界，具体做法是：使同频干扰器的无线覆盖半径小于无线服务器的无线覆盖半径，在电力调度云会商会场周界外1个同频干扰器的无线覆盖半径的边界周围，用多台同频干扰器搭建防护隔离边界，相邻同频干扰器的间距为1个同频干扰器的无线覆盖半径。

附图说明

[0088] 为了使本发明的内容被更清楚的理解，并便于具体实施方式的描述，下面给出与本发明相关的附图说明如下：

[0089] 图1是本发明的装置的结构示意图；

[0090] 图2是本发明的云会商过程描述图；

[0091] 图3是本发明的云会商过程电力调度消息流事件概率特征图；

[0092] 图4是本发明的视频分辨率分类图；

[0093] 图5是本发明的视频分辨率对比图；

[0094] 图6是本发明的具体实施例一的装置的结构示意图；

[0095] 图7是本发明的具体实施例二的装置的结构示意图；

[0096] 图8是本发明的具体实施例三的装置的结构示意图；

[0097] 图9是本发明的具体实施例四的装置的结构示意图；

[0098] 图10是依据本发明的方法中无阻塞步骤的流程示意图；

[0099] 图11是本发明的用多台同频干扰器搭建防护隔离边界的实施例图。

具体实施方式

[0100] 本发明的装置实现方式图见图1，具体说明如下。

[0101] 通过IEEE 802.11b/g无线通信设备构筑无线局域网，同时也可以通过网线或光缆构筑有线局域网，以星形拓扑结构的中心节点连接显示与展现云（具体云端设备包括投影仪和各类显示屏等），其他节点连接参与电力调度动态云会商的各类终端（例如笔记本计算机、台式计算机、服务器集群）。同时，安全管理服务器内置本发明的方法，通过拓扑结构中心节点管理整个电力调度动态云会商系统的安全性、无阻塞性和视频流的高清晰性，保障云端设备的资源共享。其中，计算机和服务器集群可以通过内置的无线通信网卡或外置的无线通信设备与中心节点连接，也可以通过有线局域网与中心节点连接，将电力调度消息流事件送到由投影仪和各类显示屏等构成的云端设备，进行动态的显示与展现。

[0102] 本发明可以解决的具体技术问题举例如下。

[0103] 当只有1台投影仪时，在会议室往往多人参加电力调度会商会议，轮流需要将自己的笔记本电脑连接到投影仪，拔插投影仪线非常麻烦。通过本发明可以非常方便地解决这一问题。图7是本发明的具体实施例一。无线云会商如下。在一台普通电脑上安装安全管理服务器软件，以太网线连接至无线服务器。无线服务器连接1080p质量的投影仪/显

示屏，每台参加云会商的计算机安装云会商客户端软件，并通过其无线局域网卡与无线服务器连接，完成无线云会商。

[0104] 当只有 1 块可用显示屏且不使用切换矩阵的情况下，多人参加的电力调度会商会议，轮流需要将自己的笔记本电脑连接到显示屏，拔插显示屏线非常麻烦。通过本发明可以非常方便地解决这一问题。图 8 是本发明的具体实施例二。

[0105] 当只有 1 台投影仪时，会商室具备有线局域网条件，通过本发明可以非常方便地实现投影仪共享。图 9 是本发明的具体实施例三。有线云会商如下。在一台普通电脑上安装安全管理服务器软件，以太网线连接至无线服务器。无线服务器连接 1080p 质量的投影仪 / 显示屏，每台参加云会商的计算机安装云会商客户端软件，并通过其有线局域网卡经过普通以太网交换机汇聚，连接至无线服务器，完成有线云会商。

[0106] 当只有 1 台投影仪时，会商室具备有线局域网条件，部分计算机会商群具备支持 IEEE802.11b/g 无线局域网功能，有线和无线可以混合使用，通过本发明可以非常方便地实现投影仪共享。图 10 是本发明的具体实施例四。有线和无线混合网云会商如下。在一台普通电脑上安装安全管理服务器软件，以太网线连接至无线服务器。无线服务器连接 1080p 质量的投影仪 / 显示屏，每台参加云会商的计算机安装云会商客户端软件。有线方式通过其有线局域网卡经过普通以太网交换机汇聚，连接至无线服务器，完成有线云会商。无线方式通过其无线局域网卡与无线服务器连接，完成无线云会商。

[0107] 上面通过特别的实施例内容描述了本发明，但是本领域技术人员还可意识到变型和可选的实施例的多种可能性，例如，通过组合和 / 或改变单个实施例的特征。因此，可以理解的是这些变型和可选的实施例将被认为是包括在本发明中，本发明的范围仅仅被附上的专利权利要求书及其同等物限制。

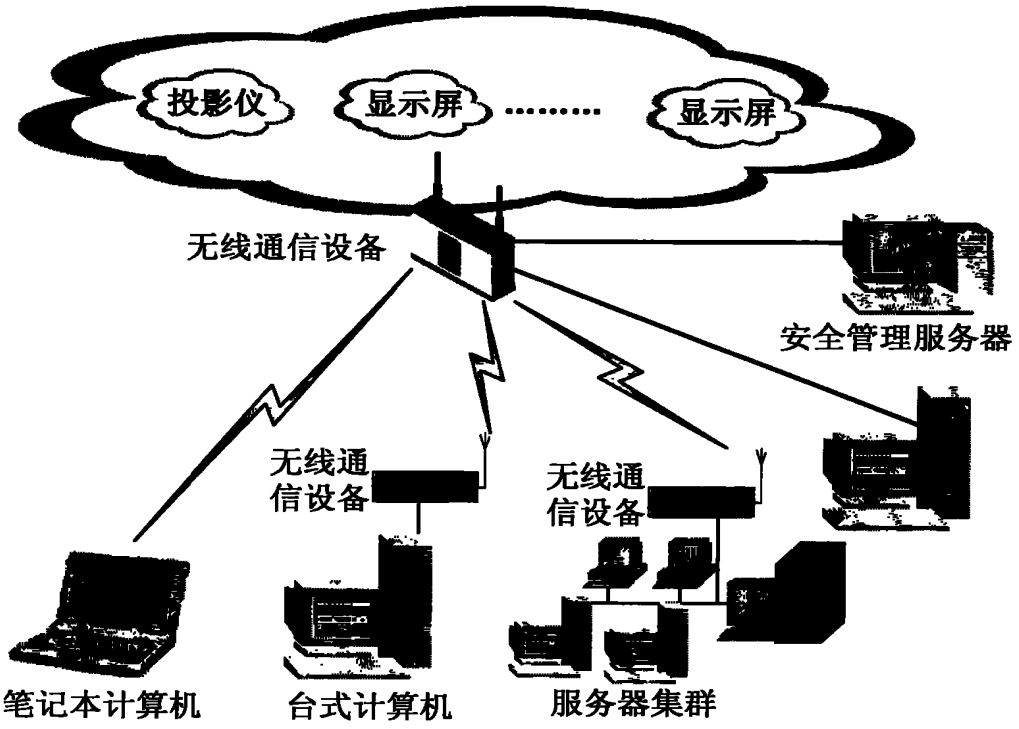

投影仪
显示屏
显示屏
无线通信设备
安全管理服务器
无线通信设备
无线通信设备
笔记本计算机
台式计算机
服务器集群

图 1

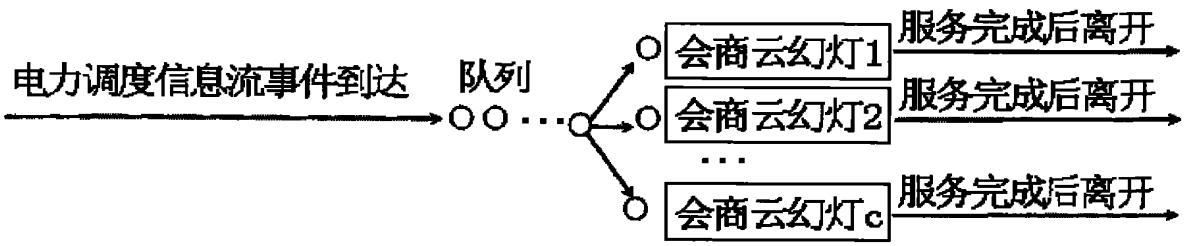

电力调度信息流事件到达
队列
会商云幻灯1
会商云幻灯2
会商云幻灯c
服务完成后离开
服务完成后离开
服务完成后离开

图 2

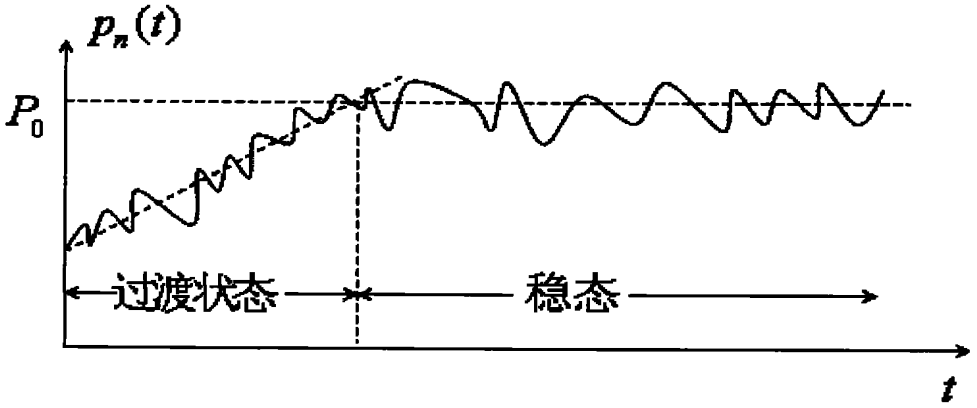

$p_n(t)$
P_0
过渡状态
稳态
t

图 3

13

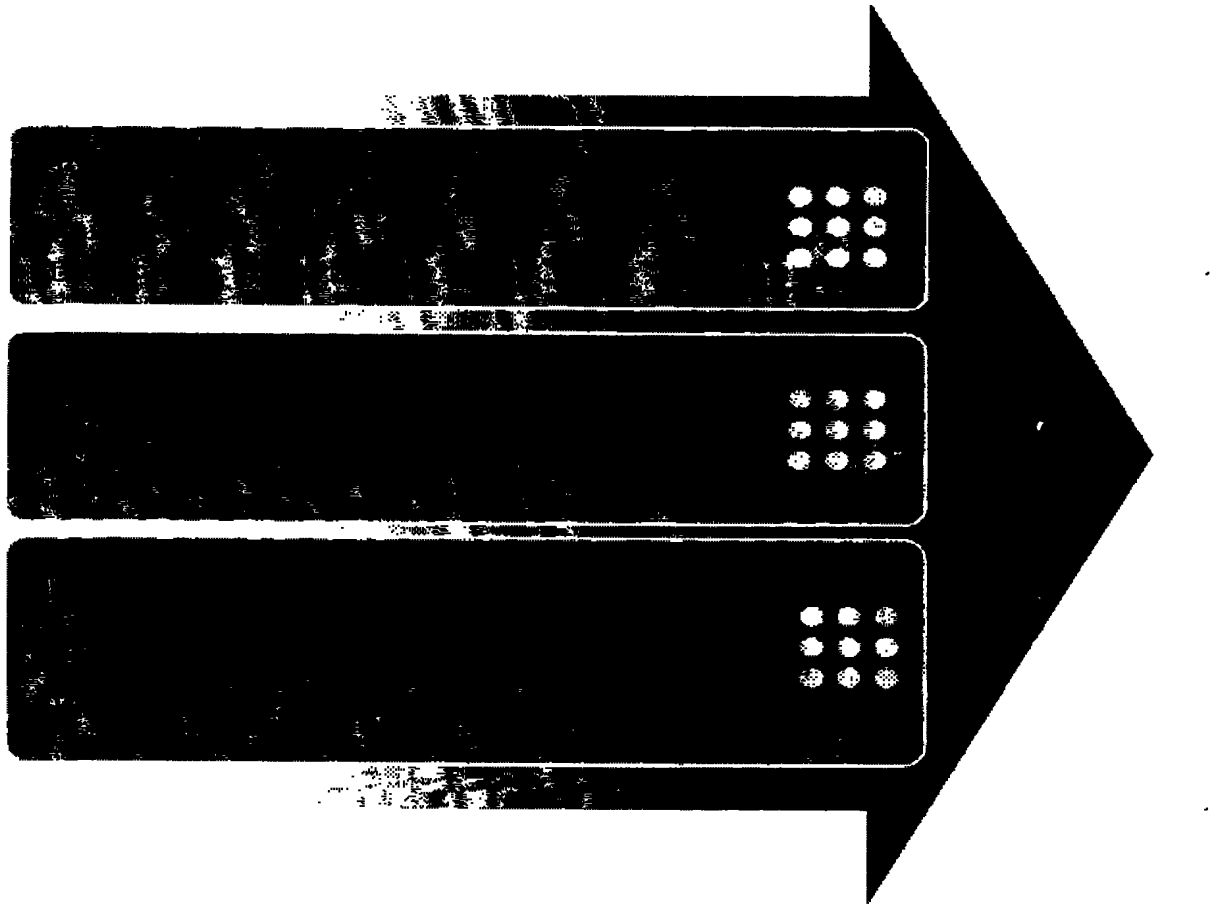
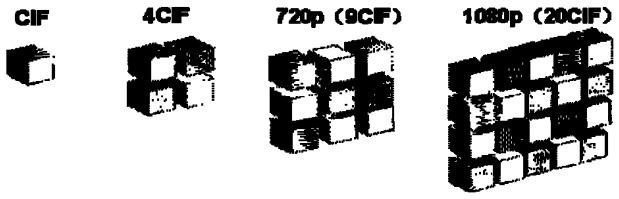
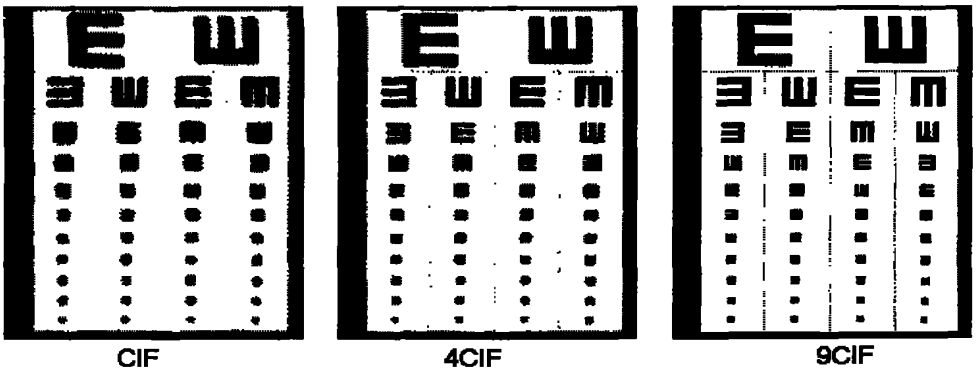
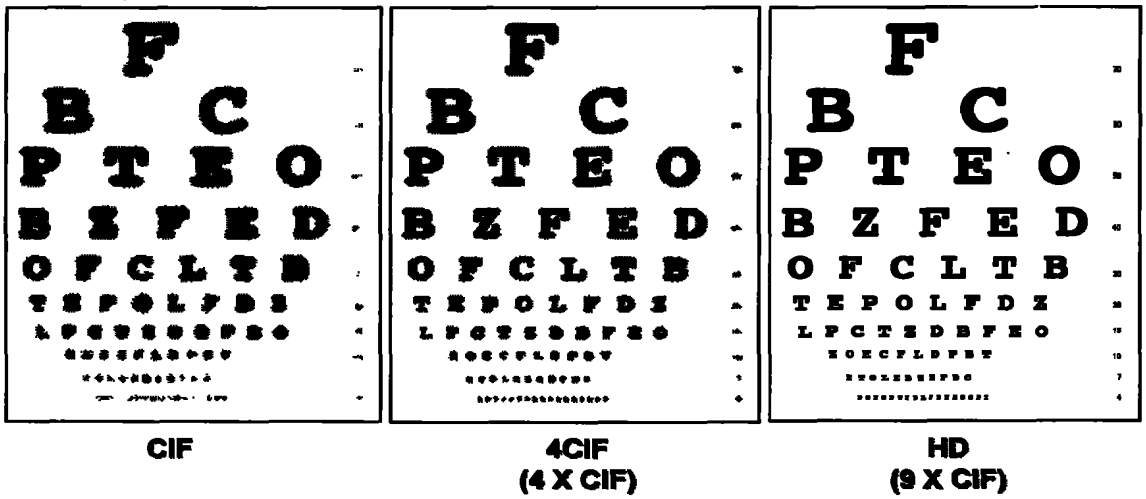


图 4


CIF
4CIF
720p (9CIF)
1080p (20CIF)


CIF
4CIF
9CIF


CIF
4CIF
(4 X CIF)
HD
(9 X CIF)

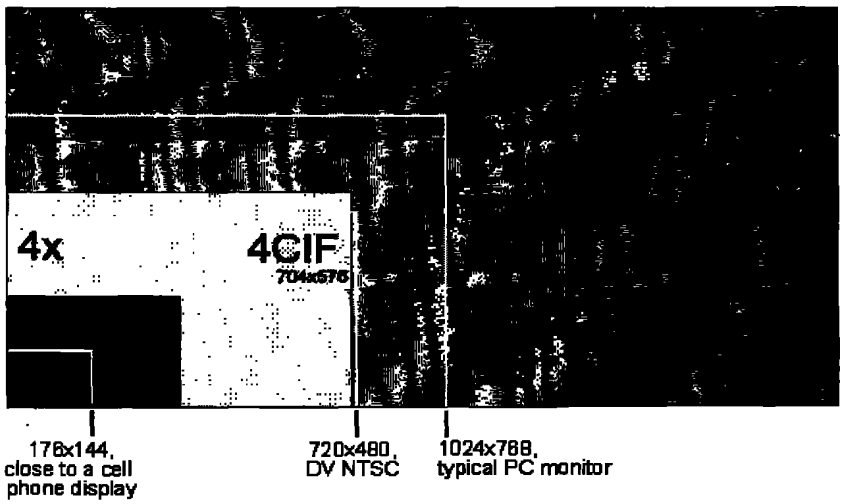

4x
4CIF
704x576
176x144,
close to a cell
phone display
720x480,
DV NTSC
1024x768,
typical PC monitor

图 5

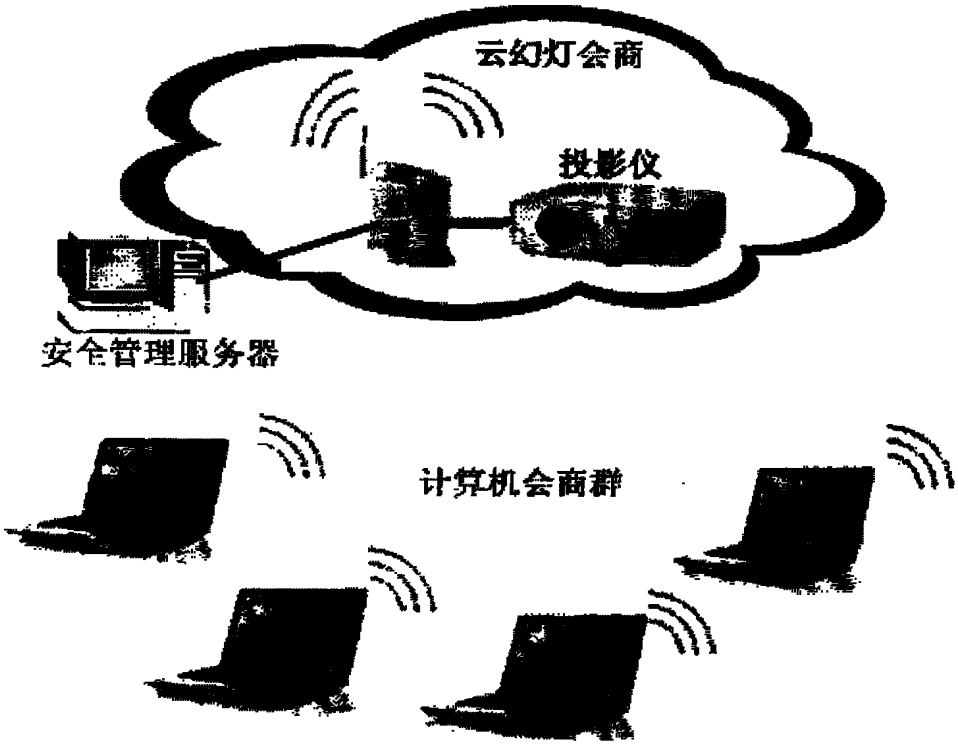


图 6



图 7

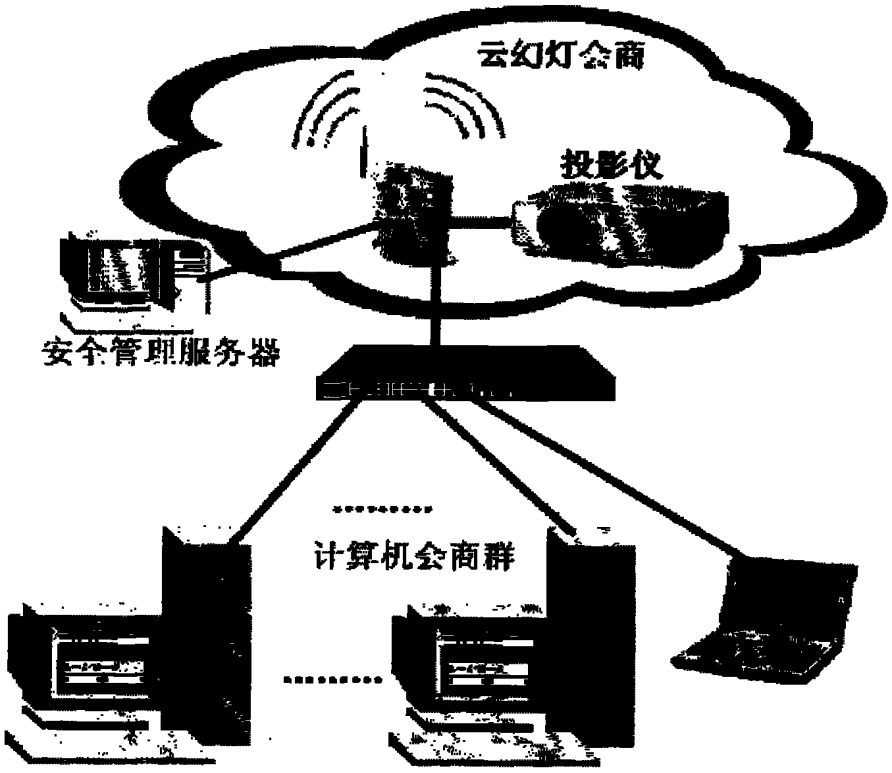


图 8

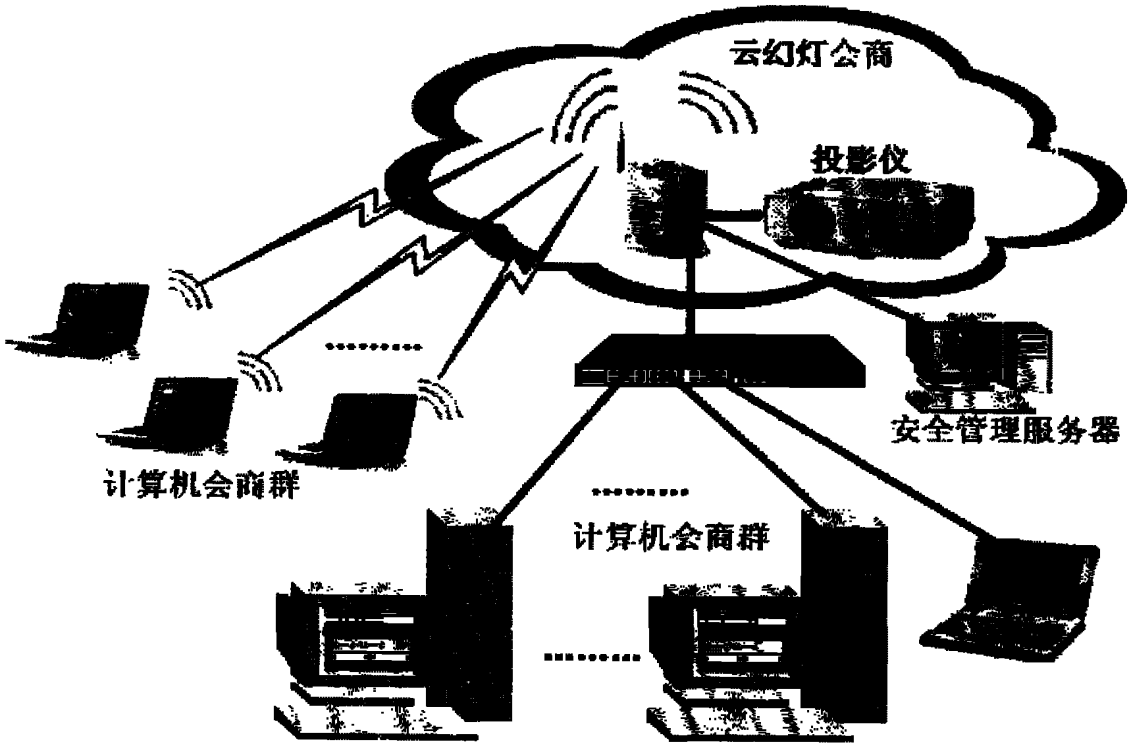


图 9

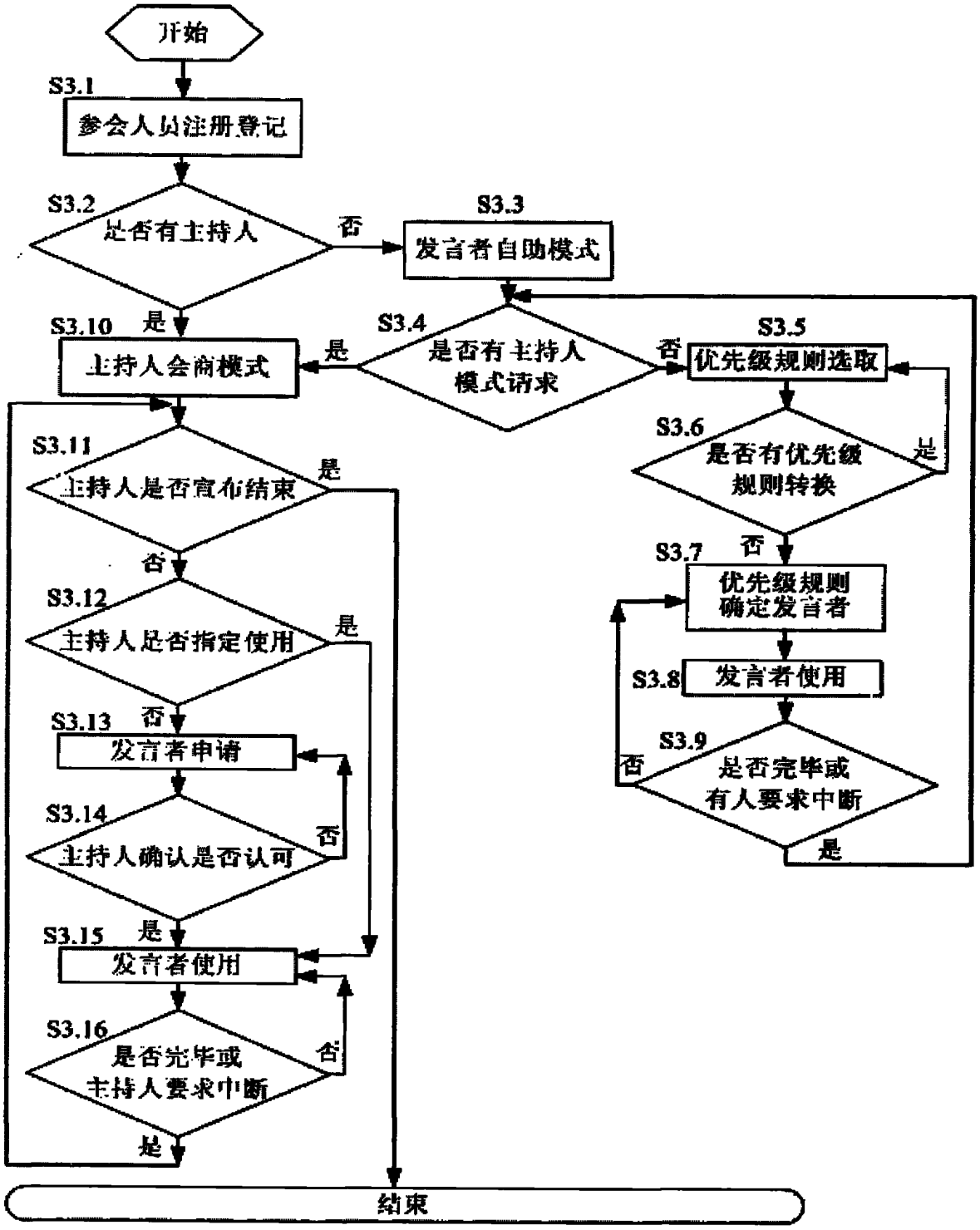

开始
S3.1
参会人员注册登记
S3.2
是否有主持人
否
S3.3
发言者自助模式
是
S3.10
主持人会商模式
S3.4
是否有主持人模式请求
是
否
S3.5
优先级规则选取
S3.6
是否有优先级规则转换
是
否
S3.7
优先级规则确定发言者
S3.8
发言者使用
S3.9
是否完毕或有人要求中断
否
是
S3.11
主持人是否宣布结束
是
否
S3.12
主持人是否指定使用
是
否
S3.13
发言者申请
S3.14
主持人确认是否认可
否
S3.15
发言者使用
是
S3.16
是否完毕或主持人要求中断
否
是
结束

图 10



图 11

CN101917402A Power dispatching cloud consultation method and device for guaranteeing safety

Data originating from sources other than the EPO may not be accurate, complete, or up to date.

The wording below is an initial machine translation of the original publication. To generate a version using the latest translation technology, go to the original language text and use Patent Translate.

Technical field

The invention belongs to the field of electric power and serves the smart grid, and particularly relates to the field of intelligent power dispatching. It integrates cloud computing, cloud consultation, security, non-blocking, high-definition video conference and wireless communication network technology, and provides a guarantee. Method and device for safe power dispatch cloud consultation.

Background technique

Cloud computing is a hot new term. The resource pool is called "cloud". The scale of the cloud can be dynamically expanded and its boundaries are blurred. The cloud is erratic in the air, and it is not necessary to determine its specific location, but it does Exist somewhere. "Clouds" are virtual computing resources that can be self-maintained and managed, usually large server clusters, including computing servers, storage servers, broadband resources, and so on. Cloud computing aggregates all computing resources and is automatically managed by software without human involvement. Cloud computing is the development of parallel computing, distributed computing, and grid computing, or commercial implementation of these computer science concepts. Cloud computing is the result of a mixed evolution of concepts such as Virtualization, Utility Computing, IaaS (Infrastructure as a Service), PaaS (Platform as a Service), and SaaS (Software as a Service). Typical cloud computing solutions that are popular today include Google Cloud Computing, Amazon Cloud Computing, Salesforce Cloud Computing, Cloud Security, and more.

The self-service-based usage model provides users with the ability to upload, build, deploy, schedule, manage, and report business services on demand. At the same time, the more self-services provided to users, the fewer necessary operations and maintenance management activities. Based on this kind of cloud computing concept, during the panoramic visualization of power dispatch conferences, the display will be "cloud" and combined with security constraints, the present invention proposes a method and device for power dispatch cloud conferences that guarantee security . Building a smart grid is a common choice for the international power industry to actively respond to future challenges, and power dispatch is an important part of the smart grid. In the process of intelligent power dispatching, the requirements for panoramic visualization of power dispatching consultations are increasing. The purpose of the present invention is to achieve "cloud" display and presentation of power dispatch conferences, to realize resource sharing of display and presentation, and to ensure its security.

Although the current power dispatch consultation system has various forms such as a voice consultation system, a video consultation system, and a telepresence consultation system, it has the following six shortcomings. First, voice, video, or telepresence consultation must be implemented in a specific conference room. Second, the display and presentation equipment of the conference is either idle or used at the same time. The demand for sharing display and display resources is outstanding. Third, if the speaker needs to display the information in the personal notebook computer, it is very troublesome to plug and unplug the projector cable / display cable, and the signal plugs / stands of the computer, projector / display and their cables are prone to failure, affecting The consultation process; fourthly, the wired and wireless consultation technology cannot be mixed under the premise of ensuring security; fifthly, the speaker self-service mode cannot be realized, and it is even more important when personnel are added during the power dispatching consultation process. Speaker self-help mode cannot be realized. Sixth, it is impossible to achieve two modes, namely speaker self-help mode and moderator mode, in the process of power dispatch consultation. The method and device of the present invention can overcome the above 6 shortcomings. First, it has an invented device, a projector / display screen, and a computer. It does not require a fully equipped conference room, and security can be guaranteed in ordinary conference rooms. Power dispatch cloud consultation; second, to achieve resource sharing of cloud devices composed of projectors and various display screens; third, power dispatch cloud consultation flow through wireless or / and wired LAN, using LAN lines and speech The computer can be connected to the computer. Fourth, the power dispatch cloud conference can be implemented through wireless LAN or wired LAN, or

through a hybrid network composed of wireless LAN and wired LAN, to ensure the security of power dispatch cloud conference; Fifth, the speaker self-help mode can be realized, and speaker self-help mode can also be realized when there are people joining in the power dispatch consultation process. Sixth, it can realize both modes in the power dispatch consultation process. , Namely speaker self-service mode and moderator mode.

Summary of the invention

The invention uses the concept of cloud computing to serve the smart grid, promotes the development of intelligent dispatching panoramic visualization, and aims at achieving display and display resource sharing. The present invention proposes the concept of Cloud Consultation, which comprehensively applies technologies such as cloud computing, cloud consultation, security, non-blocking, high-definition video consultation, and wireless communication networks, and submits a guarantee of security Method and device for power dispatch cloud consultation. An example of a specific implementation manner of the present invention is provided—a dynamic cloud consultation system for power dispatching that guarantees security.

The invention uses the random service queuing theory mathematical method to realize non-blocking of power dispatch message flow events, integrates security protocols and authentication protocols to achieve security constraints, and realizes high-definition display of 720p (9CIF) and 1080p (20CIF) through a high-speed communication network. Video streaming and slideshow images. Achieve the resource sharing of cloud devices composed of projectors and various display screens, and complete the construction of a dynamic cloud consultation system that guarantees security. Serve the smart grid and promote the development of intelligent dispatching panoramic visualization.

The present invention provides a method for power dispatch cloud consultation to ensure security, which is characterized by including the following steps:

(1)Guaranteed security

S2.1 physical protection: user security certification card, wireless device transmit power control, directional beam antenna, multiple wireless devices with the same frequency jammer to establish a protective isolation boundary;

S2.2 logical protection: IP address and MAC address association authentication, encryption, digital signature;

S2.3 Security management measures: surveillance, control, disaster recovery, emergency services;

(2)Non-blocking

S3.1 Registration of participants: Registration of participants in the power dispatch cloud conference, including name, unit, department, position, IP address, MAC address, submission topics and content;

Whether there is a host in S3.2, if not, S3.3 enters the speaker self-service mode, if there is, then S3.10 enters the host's consultation mode;

S3.3 speaker self-help mode;

Is there a moderator mode request in S3.4? If not, then S3.5; if so, S3.10 enters the moderator mode;

S3.5 priority rule selection;

Is there a priority rule conversion in S3.6, if not, then S3.7, if there is, then S3.5;

S3.7 determine the speakers and their order according to the priority rules;

S3.8 Speakers use cloud conferences to send high-definition conference TV streams and upload them to the display cloud;

Whether S3.9 is completed or someone requested interruption; if not, S3.7; if yes, S3.4;

S3.10 Host discussion mode;

S3.11 Whether the host announces the end, if not S3.12, if so, end;

S3.12 Whether the host designated the use, if not S3.13, if so S3.15;

S3.13 Speaker application;

S3.14 The host confirms whether to approve, if not S3.13, if so S3.15;

S3.15 Speakers use cloud conferences to send high-definition conference TV streams to the display cloud;

Whether S3.16 is completed or someone requested interruption; if not, S3.15; if so, S3.11;

(3)HD

Correspondence of each conference to display high-definition conference TV streams of 720p or higher quality, including the following 2 steps:

Build an IP network: The full-duplex bandwidth of the network formed by wired and / or wireless transmission channels is not less than 33Mbps; display conference display equipment including high-definition projectors and displays support high-definition conference televisions of 720p or higher quality; Step S3.5 priority rules include the following 6 categories:

First, determine the priority queue according to the submission topics and contents of the registration of participants, from large to small;

Second, in accordance with the application time sequence of the registration of participants, the Markov property of the discrete-time random process {Xi} in queuing theory is used to determine the priority queue;

Third, determine the priority queue according to the sequence of units registered by the participants;

Fourth, determine the priority queue according to the department's professional sequence in which the participants are registered;

Fifth, according to the registered job title and name sequence of the participants, the duties are from large to small, and the same job is determined according to the alphabetical order of the names;

Sixth, when people join the conference one after another during the power dispatch cloud conference, the random service queuing theory mathematical method is used to determine the priority queue rule: the first-come-first-served service (LCFS) is M / M / c / LCFS Model, important issues and content with priority service rights (PR) namely M / M / c / PR model, secondary important issues and content random service (SIRO) namely M / M / c / SIRO model, remaining general issues and content The first-come-first-served (FCFS) or M / M / c / PR model is used in the collection;

Among them, the (2) non-blocking is based on the random service characteristics of intelligent cloud consultation in power dispatching, and uses the queuing theory mathematical method to establish a mathematical model, including:

Suppose there are c consultation cloud slides, and the average service rate of each cloud slide that requires consultation is u. Under normal circumstances, the average arrival rate of the power dispatch message flow event is λ, then there is a power dispatch in Δt time. The probability of a message flow event arriving is $P1 = \lambda\Delta t$, and the probability of a power dispatch message flow event leaving within Δt time is $q1 = \lambda\Delta t$;

There are three cases:

(4)When no power dispatches message flow events, the probabilities of three mutually incompatible events are:

(a) There is no queue of power dispatch message flow events within time t, and the probability of no power dispatch message flow event arrival at time Δt is $P0 (1-\lambda\Delta t)$;

(b) There is a power dispatch message flow event within time t, no power dispatch message flow event arrives within Δt, but the probability of a power dispatch message flow event leaving after accepting cloud consultation is P1 (1-λΔt) uΔt ;

(c) There is no queue of power dispatch message flow events at time t, but there is a probability of a power dispatch message flow event arriving at time Δt, and a probability of leaving a power dispatch message flow event after cloud consultation is P0λΔtuΔt;

Then P0 = P0 (1-λΔt) + P1 (1-λΔt) uΔt + P0λu (Δt)2

Ignore the second-order small amount, finishing P1 = λP0 / u;

(5)When there are n power dispatch message flow events and 1≤n c, it can be divided into the following four cases:

(a) There are n-1 power dispatch message flow events in queue at time t, and a power dispatch message flow event arrives at time Δt, but the probability that no power dispatch message flow event is negotiated by the cloud is Pn-1λΔt (1-nuΔt);

(b) There are n + 1 power dispatch message flow events in queue at time t. No power dispatch message flow event arrives at time Δt, but the probability of a power dispatch message flow event leaving after accepting cloud consultation is Pn + 1 (1-λΔt) [(n + 1) uΔt];

(c) There are n power dispatching message flow events in queue at time t, and no power dispatching message flow event arrives at time Δt, nor is the probability of any power dispatching message flow event being negotiated by the cloud Pn (1-λΔt) (1-nuΔt);

(d) There are n power dispatch message flow events in the queue at time t, one power dispatch message flow event arrives at time Δt, and one power dispatch message flow event has the probability of leaving after accepting cloud consultations as PnλΔtnuΔt;

(6)When the number of power dispatch message flow events n ≥ c, it is similar to case (2), but the corresponding probabilities are:

(a) Pn-1 (λΔt) (1-cμΔt)

(b) Pn + 1 (1-λΔt) (cμΔt)

(c) Pn (1-λΔt) (1-cμΔt)

(d) Pn (λΔt) cμΔt

From the above formula:

The steady-state probability of the solution is:

Only when λ / cμ □1, can the consultation cloud slideshow service system reach a steady state without lining up in an infinite queue. The service intensity of the consultation cloud slideshow system is

, which means the utilization rate of the consultation cloud slideshow system;

The service rate of the conference cloud slideshow system is:

That is, when there are n (n □c) power dispatch message flow events in the system, the service rate of the system is nμ; when there are c power dispatch message flow events in the system, the service rate of the system reaches the maximum value cμ; When the number of power dispatching message flow events in C exceeds c, because c service desks are busy, the remaining power dispatching message flow events must be queued, and the service rate at this time is still cμ; therefore,

The queue length of the power dispatch message flow events in the system is

The average waiting time for power dispatch message flow events in the system is

Average time of power dispatch message flow events in the system

Average number of power dispatch message flow events in the system

Among them, the defined parameters are:

Lq: average queue length in the system;

Wq: the average waiting time of power dispatch message flow events in the system, each power dispatch message flow event hopes that this period is as short as possible;

WS: average stay time of the power dispatch message flow event in the system;

LS: the average number of power dispatch message flow events in the system;

λ: average arrival rate;

μ: average service rate;

c: the number of parallel consultation cloud slides in the system;

ρ: service intensity, that is, the average service time of each consultation cloud slide unit time interval;

P0: steady state probability of the system.

The present invention also proposes a device using the above method, which includes the following eight features:

First, the steps to ensure security and non-blocking implementation are implemented in the security management server;

Second, the wireless server supports IEEE 802.11b / g and 100M LAN interfaces, with a signal interface connected to a projector / display with a quality of 720p or higher, and a built-in H.264 soft decompression software that supports the DHCP server function. Automatically assign IP addresses to client computers;

Third, install the cloud consultation client software on the computers participating in the power dispatch cloud consultation. The software includes the steps of claims 1-2 and H.264 soft coding software;

Fourth, in the wired LAN application scenario, the computer cloud conference group is aggregated through an ordinary Ethernet switch, connected to a wireless server via an Ethernet cable, connected to a security management server and a projector / display with a quality of 720p or higher to complete power dispatch. The

display and display of conferences are "clouded" to realize the sharing of display and display resources and ensure its security;

Fifth, in the wireless LAN application scenario, the computer cloud conference group connects to the wireless server through the wireless IEEE 802.11b / g protocol through its built-in or external wireless LAN card, and the wireless server is connected to the security management server and a 720p or higher quality server. The projector / display screen completes the “cloud” display and presentation of power dispatch conferences, realizes the sharing of display and display resources, and guarantees its security;

Sixth, in a mixed network application scenario consisting of wireless LAN and wired LAN, the computer cloud conference group uses wired or wireless LAN cards, and the wired scenario is aggregated through a common Ethernet switch to connect to the wireless server. The wireless server is connected to the security management server and 720p. The projectors / display screens of the above quality can complete the "cloud" display and display of power dispatch conferences, realize the sharing of display and display resources, and ensure its security;

Seventh, the computers participating in the power dispatch cloud conference can be laptops, desktop computers, or server clusters;

Eighth, multiple co-frequency jammers are used to establish a protective isolation boundary. The specific method is to make the radio coverage radius of the co-frequency jammer smaller than the radio server's radio coverage radius, and to make a co-frequency interference outside the perimeter of the power dispatch cloud conference venue Around the boundary of the wireless coverage radius of the device, a plurality of co-frequency interferers are used to establish a protective isolation boundary. The distance between adjacent co-frequency interferers is the radio coverage radius of a co-frequency interferer.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to make the content of the present invention more clearly understood and to facilitate the description of specific embodiments, the accompanying drawings related to the present invention are described as follows:

FIG. 1 is a schematic structural diagram of a device of the present invention;

FIG. 2 is a diagram for describing a cloud consultation process of the present invention; FIG.

FIG. 3 is a probabilistic characteristic diagram of a power dispatch message flow event of the cloud consultation process of the present invention;

4 is a classification diagram of video resolution according to the present invention;

FIG. 5 is a video resolution comparison chart of the present invention;

6 is a schematic structural diagram of a device according to a first embodiment of the present invention;

7 is a schematic structural diagram of a device according to a second embodiment of the present invention;

8 is a schematic structural diagram of a device according to a third embodiment of the present invention;

9 is a schematic structural diagram of a device according to a fourth embodiment of the present invention;

10 is a schematic flowchart of a non-blocking step in a method according to the present invention;

FIG. 11 is a diagram of an embodiment of constructing a protective isolation boundary using multiple co-frequency interferers according to the present invention.

detailed description

The device implementation diagram of the present invention is shown in Fig. 1 and described in detail below.

The wireless LAN is constructed through IEEE802.11b / g wireless communication equipment, and the wired LAN can also be constructed through network cables or optical cables. The central node of the star topology is used to display and display the cloud (specific cloud devices include projectors and various display screens, etc.), Other nodes are connected to various terminals (such as notebook computers, desktop computers, server clusters) participating in the dynamic cloud consultation of power dispatching. At the same time, the security management server embeds the method of the present invention, and manages the security, non-blocking, and high-definition of the video stream of the entire power dispatching dynamic cloud consultation system through the topology center node to ensure resource sharing of cloud devices. Among them, the computer and server cluster can be connected to the central node through the built-in wireless communication network card or external wireless communication equipment, or can be connected to the central node through the wired local area network to send power dispatch message flow events to the projector and various displays Cloud devices composed of screens, etc., for dynamic display and presentation.

Examples of specific technical problems that can be solved by the present invention are as follows.

When there is only one projector, there are often many people in the conference room to participate in the power dispatch conference. It is necessary to connect your laptop to the projector in turn, and it is very troublesome to plug and unplug the projector cable. This problem can be solved very conveniently by the present invention. FIG. 7 is a first specific embodiment of the present invention. The wireless cloud consultation is as follows. Install the security management server software on an ordinary computer and connect the Ethernet cable to the wireless server. The wireless server is connected to a 1080p-quality projector / display. Each computer participating in the cloud conference installs the cloud conference client software and connects to the wireless server through its wireless LAN card to complete the wireless cloud conference.

When there is only one display screen available and the switch matrix is not used, the power dispatch conference meeting that many people attend will need to connect their laptops to the display screen in turn, and it is very troublesome to plug in the display cable. This problem can be solved very conveniently by the present invention. FIG. 8 is a second specific embodiment of the present invention.

When there is only one projector, the conference room has the conditions of a wired local area network, and the invention can easily realize the sharing of the projectors. FIG. 9 is a third specific embodiment of the present invention. The wired cloud consultation is as follows. Install the security management server software on an ordinary computer and connect the Ethernet cable to the wireless server. The wireless server is connected to a 1080p-quality projector / display. Each computer participating in the cloud conference installs the cloud conference client software, and converges through a wired Ethernet card through a common Ethernet switch, and connects to the wireless server to complete the wired cloud conference. Business.

When there is only one projector, the conference room has the conditions of wired LAN, and some computer conference groups have the function of supporting IEEE802.11b / g wireless local area network. Wired and wireless can be used in combination. Through the invention, projector sharing can be implemented very conveniently. . FIG. 10 is a fourth specific embodiment of the present invention. The wired and wireless hybrid network cloud consultation is as follows. Install the security management server software on an ordinary computer and connect the Ethernet cable to the wireless server. The wireless server is connected to a 1080p-quality projector / display, and each computer participating in the cloud conference installs the cloud conference client software. In wired mode, the wired LAN card is used to converge through an ordinary Ethernet switch and connected to a wireless server to complete wired cloud consultation. Connect wirelessly to the wireless server through its wireless LAN card to complete wireless cloud consultation.

The invention has been described above by means of specific embodiments, but those skilled in the art will also recognize the many possibilities of variations and alternative embodiments, for example, by combining and / or changing features of a single embodiment. Therefore, it can be understood that these modifications and alternative embodiments are considered to be included in the present invention, and the scope of the present invention is limited only by the attached patent claims and their equivalents.

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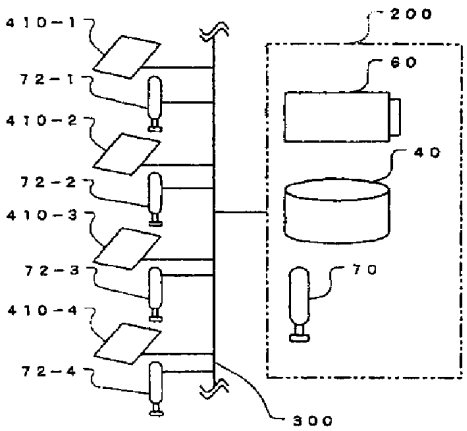
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[54]发明名称 会议系统及信息存储媒体

[57]摘要

一种会议系统,包含通过传输线路从多个数据传送装置接收传送 数据并生成反映该传送数据的会议数据的会议数据生成装置。进一 步,上述会议数据生成装置,包含用于一边按上述每个数据传送装置 管理接收到的传送数据一边将其存储在存有规定的演示用数据的上述存储装置内并根据上述每个数据传送装置的再生指示从上述存储 装置读出包含着上述传送数据及上述演示用数据的至少一部分的会 议数据的数据控制装置。



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权　利　要　求　书

1. 一种会议系统，包含通过传输线路从多个数据传送装置接收传送数据并生成反映该传送数据的会议数据的会议数据生成装置，该会议系统的特征在于：上述会议数据生成装置，包含用于一边按上述每个数据传送装置管理接收到的传送数据一边将其存储在存有规定的演示用数据的上述存储装置内并根据上述每个数据传送装置的再生指示从上述存储装置读出包含着上述传送数据及上述演示用数据的至少一部分的会议数据的数据控制装置。

2. 根据权利要求 1 所述的会议系统，其特征在于：上述数据控制装置，一边按每个规定的单位管理接收到的传送数据一边进行存储，并根据上述再生指示按每个规定的单位读出上述会议数据。

3. 根据权利要求 2 所述的会议系统，其特征在于：上述会议数据生成装置，包含用于对会议情况进行摄像的摄像装置，上述数据控制装置，将摄像数据作为上述会议数据的一部分按上述每个规定的单位存储在上述存储装置内，上述数据控制装置，根据上述再生指示按上述每个规定的单位读出存储在上述存储装置内的上述会议数据。

4. 根据权利要求 1～3 中的任何一项所述的会议系统，其特征在于：上述会议数据生成装置，包含用于对上述读出的会议数据进行再生的再生装置。

5. 根据权利要求 1～4 中的任何一项所述的会议系统，其特征在于：上述会议数据生成装置，包含用于向其他处理装置传输上述读出的会议数据的传输装置。

6. 根据权利要求 1～5 中的任何一项所述的会议系统，其特征在于：上述数据传送装置，包含多个输入装置，上述数据控制装置，一边按每个上述输入装置管理从上述输入装置传送的上述传送数据一边将其存储在上述存储装置内，并根据上述再生指示从上述存储装置读出会议数据。

7. 根据权利要求 1～6 中的任何一项所述的会议系统，其特征在于：上述会议数据生成装置，包含投影机。

8. 一种信息存储媒体，存储用于通过传输线路从多个数据传送装置接收传送数据并生成反映该传送数据的会议数据的信息并可由计算机读取，该信息存储媒体的特征在于：上述信息，包含演示用信息、

用于一边按上述每个数据传送装置管理上述传送数据一边将其存储在存储装置内的存储用信息、及用于根据再生指示从上述存储装置读出包含着上述传送数据及上述演示用信息的至少一部分的会议数据的读出用信息。

9. 根据权利要求 8 所述的信息存储媒体，其特征在于：上述读出用信息，包含用于根据再生指示按上述每个数据传送装置读出存储在上述存储装置内的上述会议数据的信息。

10. 根据权利要求 8、9 的任何一项所述的信息存储媒体，其特征在于：上述信息，包含用于对会议情况进行摄像的信息，上述存储用信息，包含用于按规定单位将摄像数据作为上述会议数据的一部分存储在上述存储装置内的信息，上述读出用信息，包含用于根据上述再生指示按上述每个规定单位读出存储在上述存储装置内的上述会议数据的信息。

11. 根据权利要求 8～10 中的任何一项所述的信息存储媒体，其特征在于：上述信息，包含用于对上述读出的信息进行再生的信息。

12. 根据权利要求 8～11 中的任何一项所述的信息存储媒体，其特征在于：上述信息，包含用于将上述读出的信息向其他处理装置传输的信息。

说　明　书

会议系统及信息存储媒体

技术领域

本发明涉及会议系统及会议用信息存储媒体.

背景技术

在现有的会议系统中，当进行演示时，由演示者在某个会场上利用个人计算机和投影机对听众进行演示.

但是，实际上，在某些情况下，需要的不仅是这种单向演示，而是允许多人对演示屏面进行写入或当对屏面进行了写入时再次重放的在演示者与演示接收者之间的双向通信方式.

作为这种重放的方法，虽然也可以考虑用录像设备进行摄影并再生的方法，但是为了将会议中的一个场面或演示中的第几章之类的一个部分进行再生就必须进行倒放或快放，因而缺乏快速性.

另外，如果只是演示数据、即预先利用应用软件生成的数据，则上述的一部分的再生还比较容易，但对进行演示时的情景、例如指示棒的动作等进行再生实际上是不可能的.

发明的公开

本发明是鉴于上述课题而开发的，其目的是提供一种可以根据指示立即对过去的会议情况进行再生的会议系统及信息存储媒体.

为解决上述课题，本发明的会议系统，包含通过传输线路从多个数据传送装置接收传送数据并生成反映该传送数据的会议数据的会议数据生成装置，该会议系统的特征在于：上述会议数据生成装置，包含用于一边按上述每个数据传送装置管理接收到的传送数据一边将其存储在存有规定的演示用数据的上述存储装置内并根据上述每个数据传送装置的再生指示从上述存储装置读出包含着上述传送数据及上述演示用数据的至少一部分的会议数据的数据控制装置.

按照这种方式，会议参加者等，可以根据指示立即重放过去的会议数据.

另外，通过一边按每个数据传送装置进行管理一边存储，可以判别出从哪个数据传送装置接收到什么样的传送数据.

进一步，还可以对反映出每个数据传送装置的传送数据的会议数

据进行再生。具体地说，例如，当多个会议参加者用其各自的输入装置传送输入数据时，可以按各个输入装置、即按每个会议参加者进行重放。

此外，这里，作为上述再生指示，具体地说，例如可以是由会议参加者或演示者用规定的再生指示装置发出的再生指示等。

另外，上述数据控制装置，最好是一边按每个规定的单位管理接收到的传送数据一边进行存储，并根据上述再生指示按每个规定的单位读出上述会议数据。

这里，作为规定的单位，例如可以采用章单位、节单位、页单位等。即，例如，如果会议参加者发出第 3 章的第 2 节部分的再生指示，则可以立即对该部分进行重放。

另外，最好是，上述会议数据生成装置，包含用于对会议情况进行摄像的摄像装置，上述数据控制装置，将摄像数据作为上述会议数据的一部分按上述每个规定的单位存储在上述存储装置内，上述数据控制装置，根据上述再生指示按上述每个规定的单位读出存储在上述存储装置内的上述会议数据。

这里，作为会议情况，例如可以是讲述者（演示者）或会议参加者用指示棒、激光指示器或手指在屏幕前或图形输入板上指示的图象及反映这些指示的图象等。

即，由于在摄像对象中不仅包含所再生的演示数据而且还包含反映了会议参加者的指示的图象等，所以可以根据摄像结果立即对指示位置及指示内容进行再生，并能适当地掌握会议中讲述者与会议参加者相互间进行讨论的会议情况。

同样，最好是包含用于对会议情况进行录音的录音装置，上述数据控制装置，将录音数据作为上述会议数据的一部分按每个规定的单位存储在上述存储装置内。

这里，作为会议情况，例如可以是讲述者或会议参加者的发言或谈话等。按照这种方式，由于还可以将声音合在一起进行再生，所以能够进一步适当地掌握会议情况。

上述会议数据生成装置，最好是包含用于对上述读出的会议数据进行再生的再生装置。

按照这种方式，可以通过显示、投影、声音再生等对所读出的会

议数据进行再生，因而使会议参加者能够立即确认会议数据。

上述会议数据生成装置，最好是包含用于向其他处理装置传输上述读出的会议数据的传输装置。

按照这种方式，可以用例如显示装置、打印装置等其他处理装置执行对会议数据的再生、打印等。

上述数据传送装置，最好是包含多个输入装置，上述数据控制装置，最好是一边按上述每个输入装置管理从上述输入装置传送的上述传送数据一边将其存储在上述存储装置内，并根据上述再生指示从上述存储装置读出会议数据。

按照这种方式，可以按各个输入装置、即按每个会议参加者进行重放。具体地说，例如，可以对反映了会议参加者用鼠标或笔式图形输入板等输入的数据的会议数据进行再生，并能立即确认出是谁进行了什么样的操作。

这里，上述会议数据生成装置，最好是包含投影机。

按照这种方式，通过采用投影机，可以实现即使是大型会议也能适应的会议系统。

另外，本发明的信息存储媒体，存储用于通过传输线路从多个数据传送装置接收传送数据并生成反映该传送数据的会议数据的信息并可由计算机读取，上述信息，最好是包含演示用信息、用于一边按上述每个数据传送装置管理上述传送数据一边将其存储在存储装置内的存储用信息、及用于根据再生指示从上述存储装置读出包含着上述传送数据及上述演示用信息的至少一部分的会议数据的读出用信息。

按照本发明，会议参加者，可以根据指示立即重放过去的会议数据。

另外，上述读出用信息，最好是包含用于根据再生指示按上述每个数据传送装置读出存储在上述存储装置内的上述会议数据的信息。

按照这种方式，可以判别出从哪个数据传送装置接收到什么样的传送数据。

另外，也可以对反映每个数据传送装置的传送数据的会议数据进行再生。具体地说，例如，当多个会议参加者使用其各自的输入装置

传送输入数据时，可以按各个输入装置、即每个会议参加者进行重放。

另外，最好是，上述信息，包含用于对会议情况进行摄像的信息，上述存储用信息，包含用于按规定单位将摄像数据作为上述会议数据的一部分存储在上述存储装置内的信息，上述读出用信息，包含用于根据上述再生指示按上述每个规定单位读出存储在上述存储装置内的上述会议数据的信息。

这里，作为会议情况，例如可以是讲述者（演示者）或会议参加者用指示棒、激光指示器或手指在屏幕前或图形输入板上指示的图象及反映这些指示的图象等。

即，由于在摄像对象中不仅包含所再生的演示数据而且还包含反映了会议参加者的指示的图象等，所以可以根据摄像结果立即对指示位置及指示内容进行再生，并能适当地掌握会议中讲述者与会议参加者相互间进行讨论的会议情况。

同样，最好是包含用于对会议情况进行录音的录音用信息，上述存储用信息，最好是包含用于将录音数据作为上述会议数据的一部分按每个规定的单位存储在上述存储装置内的信息。

这里，作为会议情况，例如可以是讲述者或会议参加者的发言或谈话等。按照这种方式，由于还可以将声音合在一起进行再生，所以能够进一步适当地掌握会议情况。

另外，这里，作为上述规定的单位，例如可以采用章单位、节单位、页单位等。即，例如，如果会议参加者发出第 3 章的第 2 节部分的再生指示，则可以立即对该部分进行重放。

上述信息，最好是包含用于对上述读出的信息进行再生的信息。

按照这种方式，可以通过显示、投影、声音再生等对所读出的会议数据进行再生，因而使会议参加者能够立即确认会议数据。

上述信息，最好是包含用于将上述读出的信息向其他处理装置传输的信息。

按照这种方式，可以用例如显示装置、打印装置等其他处理装置执行对会议数据的再生、打印等。

附图的简单说明

图 1 是本实施形态一例的会议系统的简图。

图 2 是本实施形态一例的会议情况的说明图.

图 3 是本实施形态一例的会议系统的结构图.

图 4 是表示本实施形态的会议数据及管理表的数据结构一例的简图.

图 5 是表示本实施形态一例的会议系统中的处理流程的流程图.

图 6 是本实施形态的另一例的会议系统的功能框图.

图 7 是本实施形态的另一例的会议系统的功能框图.

图 8 是采用了控制装置的会议系统的简图.

图 9 是表示采用了控制装置的会议系统中的处理流程的流程图.

图 10 是表示管理表的一例的图.

图 11 是表示以分散方式进行图象显示时的图象显示的图，（A）是表示只采用 1 台液晶投影机时的图象显示例的图，（B）是表示采用 4 台液晶投影机时的图象显示例的图.

图 12 是采用 4 台液晶投影机并以分散方式进行图象显示时的示意图.

图 13 是表示采用了虚拟机时的通信方式的示意图，（A）是表示现有通信方式的图，（B）是表示本实施形态的通信方式的图.

图 14 是进行本实施形态的分散处理时的功能框图.

图 15 是投影机中的软件部和硬件部的功能框图.

图 16 是本实施形态一例的信息存储媒体的功能框图.

用于实施发明的最佳形态

[发明的实施形态]

以下，参照附图说明本实施形态的会议系统的最佳实施例.

作为本实施形态的会议系统，例如有由具有双向连接性的通信线路或系统总线连接多个显示装置和输入装置的会议系统等. 更具体地说，例如有在某个会议参加者指示显示装置的投影或显示画面的同时另一个会议参加者用输入装置对屏面上所显示的图象附加信息的会议系统、存在着多个分别配置在相隔很远的地区的即使作为单个系统也可以使用的会议系统并通过通信路径使各会议系统之间同步连接从而为使相隔很远的地区的参加者能够参加同一会议提供支持的会

议系统等。

（关于会议系统结构的说明）

图 1 是本实施形态一例的会议系统的简图。

如图 1 所示，会议系统，在结构上包含输入装置 400、输出装置 600、既具有作为生成会议数据的会议数据生成装置的功能又具有作为再生会议数据的会议数据再生装置的功能的会议数据处理装置 2、及处理装置 700，这些装置，通过作为高速传输线路的 IEEE1934 总线 300 相互连接。

会议数据处理装置 2，除了从输入装置 400 接收传送数据、根据该传送数据生成会议数据并向输出装置 600 发送所生成的会议数据以外，还与处理装置 700 进行传送数据的发送接收。

具体地说，作为输入装置 400，例如可以是图形输入板、鼠标、键盘、扫描器、数字摄像机、携带式信息终端、携带式电话、指示棒等。而作为由输入装置 400 向会议数据处理装置 2 传送的信息（传送数据），例如可以是由图形输入板数字化后的坐标信息、将指示器在图形输入板上的移动轨迹数字化后的信息、将鼠标装置的轨迹坐标化后的信息、通过键盘输入的文字信息、所采集的像素信息、数字化后的声音信息等。此外，作为输出装置 600，例如可以是显示器、携带式信息终端、打印机等。

另外，作为会议数据处理装置 2，例如可以是液晶投影机等，作为处理装置 700，例如可以是 PC（个人计算机）、WS（工作站）、NC（网络计算机）、服务装置、主机装置等。

即，这些装置构成由多个会议参加者在 1 个会场使用并通过使这些装置相互关联而进行会议数据的生成和再生的一个会议系统。

另外，作为 PC 等计算机的处理装置 700，不是会议系统所必需的结构，作为处理装置 700 的构成要素，有处理器、ROM、RAM、二次存储装置等，但这些要素也都可以看作是会议数据生成装置构成要素的一部分。考虑到装置总体的可携带性及可再用性，将处理装置 700 装在另一壳体内，因此处理装置 700 是以分离的形式记述的。

会议系统，不仅适用于围绕一个桌子进行会议的小型会议，而且也适用于像多国间的会议那样的将相隔很远的地区的多个装置相互连接的会议。

首先说明以 1 台液晶投影机为中心的小型会议中的实施形态，然后说明多个装置相关联的相隔很远地区之间的会议中的实施形态。

（会议情况的说明）

图 2 是本实施形态一例的会议情况的说明图。

其中，由作为会议数据处理装置 2 的液晶投影机 200 将图 1 所示的会议数据 44 投射到屏幕 1020 上，演示者 1000 用指示棒 1010 进行演示。

另一方面，会议参加者 1002，利用作为输入装置 400 的图形输入板 410 输入数据。所输入的数据，通过 IEEE1394 总线 300 传送到液晶投影机 200 的通信用接口部 30，液晶投影机 200，根据传送到的数据投射构成会议数据 44 的一部分的指示数据 1012。

这里，所谓指示数据 1012，例如可以是在所投射的图象的一部分上写入文字的文字数据、在所投射的图象的一部分上写入图形的图形数据、对所投射的图象中的文字加下划线的下划线数据、用圆圈围出所投射的图象的一部分的圆圈数据等。

会议参加者 1002，除了演示数据外，还可以看到用图形输入板 410 输入的指示数据 1012。

在实际的会议情况下，即使在会议进行中有时也希望再一次看到特别指定的演示数据中的第几章的第几节并且还包括演示者 1000 的动作，或有时想要确认会议参加者 1002 指出的部位等。

在这种情况下，如果是用 PC 的应用程序生成的演示数据、且只是演示数据则可以指定并再生第几章的第几节。但是，这种方法不能对会议参加者 1002 用图形输入板 410 附加的信息及附加时刻进行再生。

另外，虽然可以用录像设备等对会议整体进行摄影和再生，但考虑到为指定第几章的第几节并将其再生而必须进行快放或倒放所必需花费的时间，当有多个会议参加者时，就不可能仅仅再生出特定的会议参加者 1002 指示的部位。

如果能够实现上述设想，就可以用多种方式有效地进行会议。

为实现上述设想，本实施形态的液晶投影机 200，如图 1 所示，利用对讲述者等指示的图象等进行摄像的摄像部 60、对会议中的谈话等进行录音并将其数字化的录音部 70、输入装置 400 等对作为 PC

的处理装置 700 生成的演示数据附加信息，并且一边将该信息与分配给各装置的地址相结合并用管理表 42 进行管理，一边将其作为会议数据 44 存储在存储部 40 内。

以下，对本实施形态的会议系统进行更为具体的说明。

图 3 是本实施形态一例的会议系统的结构图。

如图 3 所示，在由 4 个人的会议参加者 1002 分别操作图形输入板 410—1～4 进行数据输入时，按每个图形输入板 410 将输入数据存在存储部 40 内。

同样，作为讲述者的演示者 1000 的发言，由录音部 70 录音，会议参加者 1002 的谈话或发言，由按每个会议参加者 1002 设置的用作录音装置的声音数字化装置 72 采集，并作为声音记录数据按演示者 1000 及每个会议参加者 1002 存储在存储部 40 内。

对录音部 70、声音数字化装置 72—1～4、图形输入板 410—1～4 分配不重复的设备地址。

另外，声音信息的一部分，根据预先登录的规定关键字进行声音识别。对声音识别结果进行字符代码变换并记录为对会议数据的附加信息，或解释为装置控制命令。在后者的情况下，将预先登录的「快放」、「倒放」等术语翻译为进行液晶投影机 200 的动作控制的控制命令，并输入到图 1 所示的控制部 90。

另外，由图 1 所示的生成部 10 生成并存储在存储部 40 内的会议数据 44，由图 1 所示的再生部 20 按每个演示者 1000 及每个会议参加者 1002 进行再生。

以下，详细说明会议数据。

（会议数据的说明）

图 4 是表示本实施形态的会议数据 44 及管理表 42 的数据结构的一例的简图。

会议数据 44，是从[会议数据开始]标记到[会议数据结束]标记包含着多个数据字段的电子文件。

另外，会议数据 44，包含预先准备好的固定的演示数据 1420 及随着会议情况而变化的可变的附加数据 1440。演示数据 1420，通常由 PC 的 OS 的文件系统管理，并保持在作为二次存储装置的存储部 40 内。

另一方面，附加数据 1440，由借助于液晶投影机 200 的内置 OS 的功能而动作的控制部 90 管理，并存储在存储部 40 内。

进一步，会议数据 44，按会议的每个规定单位根据标号进行识别。

这里，作为规定单位，例如可以是章单位、节单位、所显示单页的页单位等。例如，当采用章单位、节单位这样的单位时，可以指示出第几章的第几节，因而在演示中可以进行特别有效的指示。

如图 4 所示，本实施形态的演示数据 1420，以第 1 章、第 1 节、1 页之类的各种单位附加标号。此外，对演示数据 1420 的[图象]标记等，还设有指示附加数据的图象数据的地址的指针，其结果是，可以使会议数据 42 的整体都能通过指定第几章、第几节、第几页读出其数据。在图中，除符号的箭头外，箭头还指示出指针的所在位置及其指示的部位的一例。

另外，例如，当采用页单位这样的单位时，与打印资料的散发单位一一对应。在使用 PC 的演示中，可以对一个单页的部分附加动图象或声音记录数据，但这时仍始终存在着形成一页的帧，因而可以解释为在形成该帧的数据的一部分中包含着包括动作的部分。

在 PC 打印领域中的一种众所周知的技术中，采用着可以记述文档体裁及打印信息的的语言（页记述语言），其中广泛普及的一种是 Adobe 公司的 PostScript 语言。假如会议数据 44 的记述采用 PostScript 语言，则很容易理解。即，可以采用利用程序语言以页为单位记述图象信息、文字信息等的方法。

在该程序语言中，可以根据像素的集合进行包含着像素的记述。在会议数据 44 的记述语言中，这种概念进一步延伸为，通过程序记述，可以将再生所采集的声音的部分及再生动图象的部分都包含在内。作为一种通用程序语言的利用解释程序进行处理的众所周知的例子，有 BASIC 语言，虽然 BASIC 语言在不包含以页为单位记述图象等概念方面与 PostScript 语言的规格不同，但适用于声音数据的再生、动图象的再生等。

在本实施形态中，只不过是在实施例中列举了 JAVA 语言作为具有双方的少许特征的解释程序语言。在 JAVA 语言的情况下，例如，具有 AWT（Abstracted Window Tools；抽象的窗口工具）及 Swinng

等不受处理系统限制的抽象化绘图用分类定义. 而 JAVA 是美国 SunMicrosystems 公司的商标.

应用软件, 利用分类功能实现用于进行所需处理的功能.

例如, 当想要使用绘图类别内的直线产生功能时, 请求执行直线产生功能的命令字, 产生发往上述类别的报文. 在执行包含该命令字的程序片时, 例如, 如果安装着 JAVA 虚拟机作为图 1 所示的变换部 50 内的虚拟机 500, 则可以在任何处理系统上绘制直线像素. 同样, 如果备有每单位时间进行多次绘制的图象生成程序, 则可以再现动图象.

另外, 声音数据, 也同样用 JAVA 语言记述声音采集数据的处理.

这些程序, 在人们能够读懂的被称作所谓高级语言的以字符代码记述的源代码级进行开发和存储. 而会议数据 44 的记述, 不限于 JAVA 语言. 例如, 也可以采用本申请人的特开平 6—4498 中的基于 PASCAL 语言的语言等各种高级语言.

另外, 如特开平 6—4498 的图 1 所公开的, 用上述高级语言记述的程序, 由编译器变换为可由中间语言解释程序解释和执行的中间语言对象. 在本实施形态中, 将按上述程序产生的中间语言对象用作会议数据 44.

在图 4 中, 从[页开始]标记到[页结束]标记, 是与一个单页相关的单位. 在该 1 个处理单位中, 存储[图象]标记、[声音]标记. [图象]标记为一连串的可变长字段的标号. 在可变长字段中, 如上所述, 根据从高级语言记述编译后的结果而生成的中间语言记述存储绘图命令. 此外, 表现为像素集合的静止图象数据, 也通过与像素转移绘图命令结合而存储于可变长字段.

对于[声音]标记, 也同样将数据存储于可变长字段.

另外, 图 4 的演示数据 1420 及附加数据 1440, 可以与一般计算机上的电子文件一样进行重写.

附加数据 1440 的重写部分, 存储在从[附加数据开始]标记到[附加数据结束]标记所围出的可变长数据部分. 在该可变长数据部分中, 存储由图形输入板等附加的图象数据及由送话器等附加的声音数据.

图象数据, 存储在[图象数据开始]标记到[图象数据结束]标记之

间，声音数据存储在[声音数据开始]标记到[声音数据结束]标记之间。

另外，在本实施例中，将对原始演示数据（演示数据 1420）附加在会议过程中附加的各种附加数据 1440 后的数据称作会议数据 44，以区别于原始演示数据。两种数据都是可用计算机处理的电子文件。

具体地说，输入到声音数字化装置 72 的声音数据，由声音数字化装置 72 内部装有的送话放大部放大到可识别的电平后，由声音数字化装置 72 内部装有的采样处理部采集为数字信号。该数据由控制部 90 根据应用软件作为会议数据 44 的一部分即附加数据 1440 存储在存储部 40 内。

在存储部 40 内，除了演示数据 1420 及传送到的附加数据 1440 以外，还存储着由控制部 90 使用的用于数据管理的管理表 42。

管理表 42，是用于识别和管理输入装置 400 等装置的表，其中包含用于识别装置的 ID、装置名、用于识别该装置的使用者的数据。

例如，演示者 1000 用指示棒 1010 操作的结果，作为附加数据 1440 的一部分存储在存储部 40 内。由于这种图象数据以与装置 ID 相结合的形式存储，所以例如当再现演示者 1000 的动作时，可以从管理表 42 进行检索而再现存储在附加数据 1440 内的该图象数据。

另外，通过将时刻数据作为附加数据 1440 附加于图象数据，也可以通过指定时刻而再现会议数据 44。

这样，按照本实施形态，可以根据第几章之类的指定立即再现会议情况，同时还可以根据演示者 1000 或会议参加者 1002 的个别指定或时刻指定有选择地再现会议情况。

以下，说明输入装置 400 的任务。作为输入装置 400 之一的图形输入板 410，在结构上包含数字化单元、坐标检测处理部、I／O 控制器、IEEE1394 总线级驱动器。

图形输入板 410 的 I／O 控制器，具有 SBP—2 协议的目标侧节点能力。另一方面，液晶投影机 200 的 I／O 控制器，控制具有 SBP—2 协议的启动端侧节点能力的 SBP—2 驱动器。

作为液晶投影机 200 的本机存储器的存储部 40，通过 SBP—2 驱动器，作为共享存储器向 IEEE1394 总线 300 开放。

由图形输入板 410 侧的 IEEE1394 总线级驱动器在与液晶投影机侧的 IEEE1394 总线级驱动器之间进行由 IEEE1394—1995 规定的总线级事务处理。通过该事务处理，图形输入板 410 通过 IEEE 总线级驱动器对 SBP—2 驱动器进行登录，并获得对上述共享存储空间的访问许可。

在获准登录的情况下，在图形输入板 410 通过 IEEE1394 总线级驱动器进行注销处理之前，可以由图形输入板 410 访问液晶投影机侧的作为共享存储空间的存储部 40。

在由数字化单元对会议参加者 1002 在图象输入板 410 上的指示动作进行了位置检测之后，由坐标检测处理部进行相对位置换算，从而变换为指示坐标及一连串的轨迹数据。通过上述的 SBP—2 协议的动作，将该指示坐标数据及轨迹数据存储在液晶投影机 200 提供的共享存储空间内。

共享存储空间，当从液晶投影机 200 观察时，是本机存储空间。因此，液晶投影机 200，可以根据需要通过内置 OS 的核心程序将该共享空间分配或复制到由虚拟机 500 的进程或线程管理的存储空间。如从另一观点考虑，则可以由液晶投影机 200 的虚拟机 500 的进程或线程随时监视（监控）使用者在图形输入板 410 上的指示动作的轨迹。

以下，说明实际会议系统中的会议数据生成处理。

（关于会议系统中的处理程序的说明）

图 5 是表示本实施形态一例的会议系统中的处理流程的流程图。

当会议开始时，开始会议数据生成处理，会议数据生成处理进行到会议结束为止。

首先，会议开始后，如会议没有结束（步骤 2），则由控制部 90 将会议数据 44 存储在存储部 40 内（步骤 4）。

在将由 PC 等生成的演示数据存储在存储部 40 内时（步骤 6），由再生部 20 对由控制部 90 从存储部 40 读出的演示数据 1420 进行再生（步骤 8）。

即，由液晶投影机 200 投影演示数据，当有声音时，还要对声音进行再生。

当没有演示数据时（步骤 6），不进行任何外部操作，而是继续进行内部处理。

当有外部输入数据时（步骤 10），控制部 90，一边按每个输入源管理输入数据一边将其存储在存储部 40 内（步骤 12）。

具体地说，例如，当传送包含着从图形输入板 410 传送到的绘图指示信息等的传送数据时，不仅存储传送数据而且还同时存储该图形输入板 410 的识别信息等，从而一边用管理表 42 按每个输入源进行管理一边进行存储。

另外，传送数据等的一部分，作为附加数据 1440 进行存储。而作为附加数据 1440，不仅包含从图形输入板 410 输入的数据，而且还包含图 2 所示的摄像部 60 的摄像范围 1060 内所含有的摄像数据。即，演示者 1000 用指示棒 1010 或手指指示的图象的位置数据，也作为附加数据 1440 进行存储。

按上述方式生成会议数据 44。

当没有外部输入数据时（步骤 10），不进行任何外部操作，而是继续进行内部处理。

另外，当由会议参加者 1002 通过操作遥控器等再生指示装置而发出再生指示时（步骤 14），控制部 90，根据再生指示的指定按每个规定单位读出会议数据 44（步骤 16～20）。

例如，如果再生指示是按每个输入源的指定（步骤 16），则按每个输入源再生会议数据 44（步骤 18）。

另外，如果再生指示不是按每个输入源的指定（步骤 16），则对所指定部分的会议数据进行再生（步骤 20）。具体地说，例如，控制部 90，判别所指定的是与演示数据 1420 对应的第几章第几节，并从存储部 40 读出与该部分对应的会议数据 44。因此，如果再生部 20 对该部分进行再生，则可以再生出所指定部分的数据。

当然，不仅是每个输入源或指定部分这种二者择一的选择，在结构上也可以将两种指定合在一起从而能同时选择两者。

按如上所述的方式进行会议数据的生成处理及再生处理。以上是将图形输入板 410 用作输入装置 400 的情况，以下说明将 PC420 用作输入装置 400 的情况。

（将 PC 用作输入装置时的会议系统例）

图 6 是本实施形态的另一例的会议系统的功能框图。

液晶投影机 202，通过 IEEE1394 总线 300 与外部存储装置 240 连接，液晶投影机 202 与 PC420 通过光纤网 310 连接。

这种会议系统，在进行联接相隔很远的地区间的会议时采用。这里，假定从设在美国的 PC420 向设在日本的液晶投影机 202 发出绘图命令。

即，所说明的例子是，在日本的会场采用液晶投影机 200 进行演示，在美国的会议参加者 1002，一边用 PC420 显示演示画面一边在由日本的液晶投影机 200 生成的演示图象上进行写入。

这里，PC420，在结构上包含具有显示演示画面的 Web 浏览器、OS（操作系统）、TCP／IP（Transmisssion Control Protocol／Internet Protocol;传输控制协议／网际协议）、PPP(Point to Point Protocol;点对点协议)等软件的控制部 422、及具有 ATM 交换机的发送接收部 424。

另外，液晶投影机 202，在结构上包含具有 CGI(Common Gateway Interface;公共网关接口）、httpd(Hyper Text Transfer Protocol Daemon;超文本传送协议守护程序)、绘图用 API(Application Programming Interface;应用程序设计接口)等软件的生成部 12、具有虚拟机 502 的变换部 52、具有分散 OS 核心程序、TCP／IP、PPP、设备驱动程序等软件的控制部 92、发送接收部（包含 ATM 交换机）、及具有 IEEE1394 总线级驱动器的通信用接口部 32。

另外，外部存储装置 240，在结构上包含控制部 290、及具有 IEEE1394 总线级驱动器等的通信用接口部 292。

以下，说明本会议系统中的会议数据生成处理。

首先，在美国，在 PC420 的屏面上显示着演示图象的状态下，操作 PC420 的会议参加者 1002，在画面的 Web 浏览器上进行用于对演示图象进行写入的操作。

该操作命令，由控制部 422 变换为以 TCP／IP 等协议为依据的形式，同时将包含操作命令的传送数据变换成可以由编译器变换为可生成会议数据的数据形式的形式，并由发送接收部 424 通过光纤网 310 向液晶投影机 202 发送。

在液晶投影机 202 中，由通信用接口部 32 接收发送到的传送数

据，并由控制部 92 进行传送控制等。发送到的传送数据，用虚拟机 500 变换为可生成会议数据的形式，并由生成部 12 生成会议数据。

从 PC420 发送到的传送数据及所生成的会议数据，由通信用接口部 32 通过 IEEE1394 总线 300 向外部存储装置 240 发送，并在外部存储装置 240 中一边由控制部 290 按每个处理装置及每个规定单位对由发送接收部 292 接收到的传送数据及会议数据进行管理一边进行存储。

另外，所生成的会议数据，用液晶投影机 202 在日本的会场显示，同时由通信用接口部 32 向 PC420 发送。在 PC420 中，将接收到的会议数据再次显示在屏面上。

上述的发送接收处理及数据传输，尽管是传输像会议数据这样的大型数据，但由于采用了 IEEE1394 总线 302 和光纤网 310，所以仍能极高的速度进行。

按照上述方式，在美国的会议参加者 1002，能够以与在日本的会场上操作液晶投影机 202 的同样的感觉从相隔很远的地方操作液晶投影机 202。

另外，传送数据及会议数据存储在外部存储装置 240 内，而且在 PC420 与外部存储装置 240 之间也由高速传输线路连接，所以可以响应从 PC420 进行的操作而立即再生出所需要的部分。

因此，可以实现即使在相隔很远的地区之间进行会议时也能迅速地重放会议数据的会议系统。

进一步，通过将存储会议日志（历史记录）的外部存储装置 240 与投影机 202 分别设置，即使是使构成外部存储装置 240 的硬盘为 RAID（Redundant Array of Inexpensive Disks; 廉价盘冗余阵列）结构从而提高数据的可靠性并确保大容量的存储容量时，也能实现通用性高的液晶投影机 202 而无须改变液晶投影机 202 本身的大小。

即使是如上所述将用于存储会议数据的存储装置与液晶投影机 202 分别设置时，也由于能以极高的速度进行液晶投影机 202 与外部存储装置 240 之间的通信，因此几乎不存在性能上的问题。

以上是将 PC420 用作输入装置 400 的例，以下，说明将服务装置用作数据传送装置而对传送数据进行传送的情况。

（将服务装置用作数据传送装置时的会议系统例）

图 7 是本实施形态的另一例的会议系统的功能框图。

本实施例中的会议系统，在结构上包含用于再生会议数据的液晶投影机 200 及服务装置 100。

液晶投影机 200，与上述的液晶投影机 200 相同。

服务装置 100，在结构上包含存储着显示用数据、控制用数据、组件对象等的存储部 102、发送接收部 104、及控制存储部 102 及发送接收部 104 的数据传输的控制部 106。

这里，作为显示用数据，例如可以是图象数据、演示数据、会议数据等，作为控制用数据，具体地说，例如可以是设备驱动程序、用于指定坐标等绘图范围的数据、用于指定线或圆等绘制对象类别的数据等。

特别是，考虑到图象数据以两种形式生成，因而需要设计处理系统。第 1 种形式是将图象整体作为像素集合而生成。当用图象扫描装置采集自然图象的照片时，将每个像素定义为伴有不同灰度等级的色彩数据，并将图象整体定义为该像素的集合。

第 2 种形式是由任何一种命令字产生像素。在利用直线、贝济埃曲线、圆弧等的组合表示图形的处理系统中，直线产生命令（通常是指定绘图起始坐标、终止端坐标、线宽），根据作为对象的处理系统的析像度或坐标系产生点列并形成像素，从而绘制出图形的一部分。

在大多数情况下，计算机装置的图象显示系统，用前者的像素集合表示图形，同时用后者的命令字表示图形。此外，采用轮廓字形产生文字的方式，由于原来的文字形状由直线?曲线绘图命令记述，所以是属于后者的例。如后文所述，根据命令字产生像素，是使用多台液晶投影机在大范围区域上绘图的应用例，是需要进行分散处理的最佳例。

当根据任何绘图命令产生像素时，必需有进行该操作的程序，而且，该程序必须是可以在包含着作为对象的处理器的硬件上执行的形式。在本实施形态中，将这种程序的执行单位称作「组件对象」。

组件对象，用作进行图象生成或再生用的软件的一部分。具体地说，例如可以是 JAVA 小应用程序或 JAVA Beans 等。

例如，假定服务装置 100 是 Web 服务器，并且是将各种用于会议数据生成的数据存储在存储部 102 内的形态。

液晶投影机 200，可以从服务装置 100 下载设备驱动程序、JAVA 小应用程序等。

按照这种方式，可以很容易地扩展液晶投影机 200 的功能。即，当必需召开新形态的会议时，会议的主办者将必要的信息存储在服务装置 100 内，会议参加者 1002，则可将必要的信息从服务装置 100 装入液晶投影机 200，从而能够迅速地适应新形态的会议。

具体地说，例如，在液晶投影机 200 中当前具有在屏面的一部分上画线的功能时，通过接收具有用圆圈围出屏面的一部分的功能的组件对象并装入会议数据生成用程序，可以追加用圆圈围出屏面的一部分的功能。

另外，由于不是用硬件而是可以用软件进行功能扩展，所以可以对液晶驱动电路等进行简化。即，一般来说，在液晶投影机中，由 AD 转换器将图象数据变换为数字信号，并将图象信息存储在第 1 帧存储器内。然后，由数字滤波电路对图象信息进行卷积运算并存储在第 2 帧存储器内。接着，以一定的周期读出第 2 帧存储器内的图象数据，以便由液晶控制器将其显示在液晶光阀上。

另外，这里，所谓卷积运算，指的是一种图象滤波技术，用于根据图象的清晰度改变抽头系数，从而改变画质。

在这些驱动电路中，因所输入的图象数据的不同等而造成由相位差引起的图象恶化，为了减小该相位差，必须采用高性能的 PLL 电路。此外，在假定将多台析像度不同的液晶投影机相互连接的情况下，必需提供用于进行图象插补的图象处理的换算电路。但这种图象处理将会使图象恶化。

另一方面，如果像本实施形态这样采用使装有虚拟机 500 的液晶投影机 200 的各部动作的应用软件并根据液晶的像素数对输入到液晶投影机 200 的图象数据进行数据变换，则不会产生因换算电路的图象处理而引起的图象恶化，由于不需要设置多个帧存储器，所以能够简化电路结构。

作为这种应用软件，例如可以采用通过虚拟机 500 将所输入的图象数据的显示图象在 VRAM（视频 RAM）内展开并进行将 VRAM 内的显示图象通过液晶控制器显示在液晶板上的处理的软件。

以上，以液晶投影机 200 和输入装置 400 为中心进行了说明，但

对于液晶投影机 200 和输出装置 600，也可以获得同样的作用效果。

即，例如，用液晶投影机 200 生成会议数据，并由通信用接口部 30 向输出装置 600 发送所生成的会议数据。

这里，作为输出装置 600，例如采用打印机时，会议参加者 1002，可以根据输出指示打印该会议数据。

另外，作为输出装置 600，例如采用显示器时，会议参加者 1002，可以根据输出指示显示该会议数据。

这种情况下的输出指示，也可以按每个输入装置 400 及每个规定单位进行，会议参加者 1002，可以根据指示立即得到自己请求的会议数据。

如上所述，虽然会议系统都能以液晶投影机 200 为中心构成，但如采用控制装置，则也可以实现新形态的会议系统。

（采用了控制装置的会议系统例）

图 8 是采用了控制装置 900 的会议系统的简图。

将 1 个控制装置 900 与进行会议数据处理的多个处理装置通过由作为传输线路的 IEEE1394 总线 300 构成的网络连接，在各处理装置之间进行传送数据的发送和接收并生成会议数据。

控制装置 900，在结构上包含存储部 910、在管理各处理装置与网络的连接状态的同时还管理存储部 40 内的数据的管理部 920、对控制装置 900 内的数据的传输进行控制的传输控制部 930。

另外，作为处理装置，例如可以采用携带式信息终端 402、扫描器 404、液晶投影机 200、PC400、打印机 602 等各种装置。

在这种形态中，按如下方式进行会议数据的处理。

图 9 是表示采用了控制装置 900 的会议系统中的处理流程的流程图。

开始时处于控制装置 900 起动并与 IEEE1394 总线 300 连接的状态，其他装置也与 IEEE1394 总线 300 连接。（步骤 32）。

当连接某个处理装置时，包含着指示连接后的状态及该处理装置提供的服务的信息包的传送数据被传送到控制装置 900。这里，所谓服务，指的是各处理装置提供的功能。

控制装置 900，当接收包含上述信息包的传送数据时，由管理部 920 在存储部 910 所存储的管理表中确认已完成登录的提供服务（步

骤 34），如已登录着同一种提供服务，则对优先级等进行调整（步骤 36）。

管理部 920，在确认提供服务后，将提供服务登录在管理表内（步骤 38）。

图 10 是表示管理表 912 的一例的图。

在管理表 912 中，主要存储着用于识别各处理装置的 ID、该处理装置提供的服务、该处理装置的状态。该识别用 ID，即使在多个处理装置与网络连接的情况下，也分配不重复的 ID 值。

控制装置 900，当接收包含着指示服务请求的信息包的传送数据时（步骤 40），用管理部 920 检索管理表 912，搜索可提供能够响应该服务请求的服务的处理装置。

例如，当从携带式信息终端 402 发出想要打印会议数据的一部分的请求时，控制装置 900，用管理部 920 检索管理表 912，搜索可提供打印服务的处理装置，当搜索到提供该项服务的打印机 602 后对其状态进行确认并处于能够进行处理的状态时，传送控制部 930 在请求服务的携带式信息终端 402 与响应该服务的打印机 602 之间建立连接。

一旦建立了连接，就可以在发出请求的处理装置与响应请求的处理装置之间发送和接收会议数据等传送数据而无须再通过控制装置 900。

在这种情况下，例如，建立连接后，将会议数据的一部分从携带式信息终端 402 发送到打印机 602，并由打印机 602 提供打印服务（步骤 42）。

这样，如采用控制装置 900，则可以实现能够对服务进行一元化管理并能根据所应用的会议的情况灵活地变更处理装置的会议系统。

即使在这样的会议系统中，也最好在控制装置 900 及各处理装置内安装虚拟机 500。其原因是，通过采用虚拟机 500，在发送传送数据时可以完全不考虑发送目的端的机型或 OS 等，从而可以增加装置结构的自由度，并能进行更为多样的会议。

作为将上述的控制装置 900 与多个处理装置连接的技术，例如有美国 SunMicrosystems 公司的 Jini，但本实施例在可以将图 4 所示

的会议数据 44 存储在控制装置 900 的存储部 910 内并能进行更新、管理这一点上与 Jini 截然不同。

在以上说明过的例中，说明了 1 个处理装置提供一项服务的例，但以下将对由多个会议数据再生装置提供一项服务、即边进行分散处理边再生会议数据的情况进行说明。

（关于分散处理的说明）

目前的大多数在商用 PC 的 OS 下开发的应用软件，通过编译，翻译为可由微处理器直接解释的机械语言。在这种方法中，一般必须从应用软件的开发阶段起就必须考虑到使用该应用软件的微处理器的体系结构及与 OS 的服务例程之间的程序间接口（通常称为 API: Application Programming Interface;应用程序设计接口）并进行程序设计。

可是，在本实施形态的会议系统中，以液晶投影机 200 或用作处理装置 700 的 PC 或 WS 为中心，翻译和执行会议数据 44 或原始演示数据。

液晶投影机 200，每当实际商品化时，即使从以适当的价格为使用者提供最佳的装置考虑，在设计时也不能限定于某种微处理器，对于处理装置 700 也可以说是同样的。此外，作为处理装置 700，不仅使用 PC 或 WS，也应设想到使用携带式信息终端，以便在外出要去的地方使用。

当以上述各种规格不同的微处理器及 API 不同的 OS 的混合环境为前提时，为了将各个环境的差别抽象化并提供可以共同使用的环境，应使用虚拟机的解释程序（例如虚拟机 500）。

使用虚拟机的解释程序可以解决的问题，主要是消除不同的计算机体系结构的差别（执行环境的抽象化）。

另一方面，在会议系统中发送接收的传送数据，是动图象这样的大型数据，而且，当会议要进行几小时之久时也要发送接收大量数据。

为能有效地处理这种大型且大量的数据，不仅需要虚拟机的解释程序，而且既需要高速传输线路又需要可以进行在各装置中动态地分散处理负荷的动态分散处理的结构。

图 11 是表示以分散方式进行图象显示时的图象显示的图，（A）

是表示只采用 1 台液晶投影机时的图象显示例的图，（B）是表示采用 4 台液晶投影机时的图象显示例的图.

当以 1 台液晶投影机 200 进行图象显示时，可以由将会议数据传送到液晶投影机 200 的 PC 进行 UXGA 显示、即 1600×1200 点的显示，但在该液晶投影机 200 只能对应地达到 XGA 显示、即 1024×768 点的显示的状态下，根据演示者的指示，有时指示器将可能指示出可以在 PC 上显示但在液晶投影机 200 上却不可能显示的坐标（1500，920）

在这种情况下，如图 11（A）所示，实际上在液晶投影机 200 上不能显示. 因此，由于演示者不能使指示器按照自己的操作而动作，所以也会发生不能进行有效的演示的情况.

为避免发生这种情况，如图 11（B）所示，可以采用 4 台液晶投影机 200，以分担的方式投射 4 个图象 1210—1～4，以便能够支持与 PC 上的显示对应的显示区域.

图 12 是采用 4 台液晶投影机 200—1～4 并以分散方式进行图象显示时的示意图.

当以分担的方式显示 1 个图象时，本来必须决定由哪个装置分担哪个区域. 采用 4 台液晶投影机将某个图象在空间上划分后进行显示，是典型的并行处理方式. 在用处理装置 700 的应用软件生成原始演示文件的阶段，如果记述适用于这种并行处理的并行句法，则在处理上是很方便的. 在特开平 6—4498 中，公开了一种书写和翻译 cobegin coend 中包含的并行执行单位的方法，这种方法在本实施形态中也可以使用.

图 13 是表示采用了虚拟机 500 时的通信方式的示意图，（A）是表示现有通信方式的图，（B）是表示本实施形态的通信方式的图.

为进行上述的动态分散处理，不仅需要在投影机 200 内安装虚拟机 500，而且在生成应用软件、即应用层程序 12 的阶段必须在充分考虑由哪台液晶投影机 200 分担哪个绘图区域后生成.

一般来说，为了对程序的某个执行单位进行并行处理，必须满足以下的 2 个条件. 首先，第 1 个条件是，包含 OS 的对象程序处理系统必须具有可以平行地执行某个程序片、亦即执行单位的资源，更具体地说，必需有与并行处理的个数相对应的独立的处理装置. 第 2 个条件是，必须将对象程序本身记述为具有可并行执行的处理单位且可

以在处理系统中对其进行判断。

另外，在本实施形态中，所谓「分散执行」，是并行执行的广义概念，在将某个处理单位分散到其他处理系统执行的情况中，将希望在时间上平行处理而且在取得结果的时刻必须同步的特殊情况称作「并行执行」。

例如，如图 13（A）所示，在将 2 台液晶投影机 200—5、6 通过 IEEE802.3 总线 192 连接的情况下，应在各应用层程序 12—5、6 之间建立在图象上相互呼应的连接。当开始对原始演示数据进行解释的第 1 台液晶投影机 200—5 在程序的语句中检测到超出了自己的显示范围时，便试着要与液晶投影机 200—6 对该部分进行分散处理。

这时，作为具体的动作，读取液晶投影机 200 的内置 OS 的传输控制程序的控制部，通过 IEEE802.3 总线 192 打开与液晶投影机 200—6 连接的线路，并传输分散处理的对象范围。

应用层程序 12—5，必须利用内置 OS 的服务例程依次执行网络连接、线路的打开，处理部分的传输等处理。另一个应用层程序 12—6，则被要求执行同样的网络连接、容许线路打开，处理部分的接收等服务侧的处理。

为了使用多台液晶投影机，只要求进行上述这些处理就使作为原始演示文件记述的应用层程序 12—5、6 的规格变得很复杂了，每次都必须根据执行环境专门改写。

如上所述，这里看到的应用层程序 12，实际上是由用于生成演示资料的另一个应用层程序生成的原始演示数据。如图 4 中的例所示，原始演示数据的内容，可以解释为由虚拟机 500 执行的中间语言对象的命令字集合。

为方便使用，必须设计成从开始时在应用层程序中就以一定程度的并行处理为前提交叉地记述着多种并行句法，并当执行环境允许并行处理时可以并行地执行。作为代替方法，也可以由虚拟机 500 在执行阶段以动态且独立的方式与其他虚拟机相互通信并将处理分散。

作为前者的预先记述多种并行处理句法的方法，可以安装本申请人在特开平 6—4498 中公开的中间语言解释程序间的通信方式。

另外，作为后者的在执行阶段以动态且独立的方式与其他虚拟机相互通信的方式，例如，可以采用使用 JAVA 虚拟机实现的方法、基

于多节点的方法等.

通过采用上述方法，即使是在液晶投影机的台数增加到 16 台、64 台等情况下，也无需再次改写原始演示数据。

在本实施形态中，如图 13（B）所示，采用了实现各节点之间的存储资源远距离访问的 IEEE1394 总线 300。

在安装本申请人在特开平 6—4498 中公开的中间语言解释程序间的通信方式的情况下，某台液晶投影机 200—1 的虚拟机 500—1 的主解释程序，在装入阶段，将以中间语言在作为所执行的进程的从属侧解释程序的工作区内记述的对象代码读入到另一台液晶投影机 200—2 的存储空间上，然后读入栈初始化数据，并根据该数据的指示将初始状态的数据存储在栈内并设定栈指针。

接着，读入表初始化数据，并进行对执行时数据块管理表及共享资源管理表的内容进行初始设定的一系列动作。上述动作，可以借助于采用了 RS232C 串行线路等的通信、或安装于通常在 UNIX 系统的 OS 中见到的网络文件系统等的传送层以上的上位层协议实现。但是，为了能以现实的处理速度进行远距离存储器访问，必须通过 IEEE1394 的总线事务处理进行安装。

按照这种方式，当生成应用层程序 12—1、2 时，无须考虑绘图分担区域等即可生成，并且可以在比应用层程序 12—1、2 低 1 级的各虚拟机 500 之间在图象上建立虚拟的连接。

以下，详细说明将 JAVA 虚拟机用作虚拟机 500 时的本实施形态的分散处理。

图 14 是进行本实施形态的分散处理时的功能框图。

液晶投影机 200—1，包含安装有用于将从作为数据传送装置的其他液晶投影机 200—2 等传送的传送数据变换为可生成或再生的数据形式的虚拟机 500 的变换部 50、及用于从输入装置 400 接收可由变换部 50 变换的传送数据的通信用接口部 30。

另外，液晶投影机 200，还包含根据由变换部 50 变换后的传送数据生成会议数据的生成部 10、一边按每个其他的液晶投影机 200 且按每个规定单位对所生成的会议数据进行管理一边将其存储在存储部 40 内并按每个其他的液晶投影机 200 且按每个规定单位读出会议数据的控制部 90、及对所读出的会议数据进行再生的再生部 20.

在存储部 40 内，除了包含着演示用数据及所传送到的传送数据的会议数据以外，还存储着由控制部 90 使用的管理用表 42 等。

另外，存储部 40，可以由其他的液晶投影机 200 等通过通信用接口部 30 访问。

以下，说明本实施形态中使用的虚拟机 500。

图 15 是投影机 200 中的软件部和硬件部的功能框图。

软件部，在结构上包含具有声音处理用 API(Application Programming Interface;应用程序设计接口)及图象处理用 API 的生成部 10、具有多个命令字、对命令字的调度程序、多个设备驱动程序、运行期程序库的控制部 90、及虚拟机 500。

另外，也可以代替声音处理用 API 或图象处理用 API 而安装声音处理级或图象处理级。

所谓本实施形态中使用的虚拟机 500，意味着读取通用的文件格式并因此可以进行所指定的操作的装置，具体地说，例如采用 JAVA 虚拟机或上述特开平 6－4498 中公开的装有可进行并行处理的解释程序的虚拟机等。

作为 JAVA 虚拟机的安装方式，可以采用安装在软件部的解释程序方式、编译方式、安装在硬件部的专用 CPU 方式等，但在本实施形态中安装在软件部内。

虚拟机 500，在结构上包含各具有 1 个程序计数器和 1 个栈的多个线程、及堆区域。即，栈和堆区域是工作区，也起着存储部 40 的作用。

另外，由于栈有多个，所以能够进行所谓的多线程处理。因此，可以提高分散处理时的执行性能及并行执行性。

另外，硬件部，在结构上包含装有显示部的再生部 20、具有视频控制器的控制部 90、具有视频 RAM（V－RAM）区域的存储部 40、及具有 IEEE1394 链路层和 IEEE1394 物理层的通信用接口部 30。

以下，说明采用了多台液晶投影机 200－1、2 的实际显示处理。

假定液晶投影机 200－1 用作主投影机，而液晶投影机 200－2 用作从属投影机。

假定液晶投影机 200－1 绘制图象 1210－1、即坐标（0，0）～坐标（1024，768）。该绘图信息存储在存储部 40 内。

当第 2 台液晶投影机 200—2 连接于 IEEE1394 总线 300 时，用作主投影机的液晶投影机 200—1 与用作从属投影机的液晶投影机 200—2 可以发送和接收传送数据。

在这一阶段，液晶投影机 200—2 可以判断液晶投影机 200—1 已经动作，同时参照液晶投影机 200—1 的存储部 40—1 的绘图信息，从而可以确认液晶投影机 200—1 分担的绘图区域。

液晶投影机 200—2，在该确认后，从液晶投影机 200—1 的存储部 40—1 读出应由自己显示的图象信息并由虚拟机 500 变换为可由自身装置处理的数据形式而写入 V—RAM 区域，并在视频控制器的控制下在显示部上进行显示。

如上所述，存储部 40 内的栈区域按每个线程提供。即使某个线程内的栈区域因多线程处理而处于使用之中，也仍可以使用其他线程的栈区域，所以即使在共享存储部 40 的情况下，其并行执行性也几乎没有降低。

另外，通过采用 IEEE1394 总线 300 及 IEEE1394 总线接口，可以高速地发送和接收传送数据，所以，即使在共享存储部 40 的情况下，各液晶投影机 200 也都能以与参照自己的存储部 40 几乎相同的速度参照其他液晶投影机 200 的存储部 40.

另外，例如，有时也可以是显示能力不同的液晶投影机 200 混合存在的情况，即某台液晶投影机 200 是 VGA 显示、即 640×480 点显示，另一台液晶投影机 200 是 SVGR 显示、即 800×600 点显示，而另外一台液晶投影机 200 是 XGR 显示、即 1024×768 点显示。

在上述情况下，即使是必须显示上述的坐标（1500，920）时，也可以通过将具有不同显示能力的液晶投影机 200 相互连接而进行显示。例如，如果主液晶投影机 200 是 VGR 显示、则如将全部 9 台液晶投影机 200 连接，则可以覆盖 1920×1440 点的显示区域，因此也就可以显示出坐标（1500，920）。

即使在这种情况下，从属液晶投影机 200 也可以通过参照主液晶投影机 200 的存储部 40 内的绘图信息而自动调整显示能力。

这样，由于可以通过有效的分散处理生成会议数据，所以即使是大型且大量的会议数据也能舒畅地生成和再生，因而可以实现响应快的会议系统。

另外，不仅是基于共享存储器方式的分散处理实现方式，也可以按对象传送方式进行上述的分散处理。

以上，说明了实现会议系统的方法，但也可以用计算机可读取的信息存储媒体实现取得上述作用效果的会议系统。

（关于信息存储媒体的说明）

图 16 是本实施形态一例的信息存储媒体的功能框图。

信息存储媒体 1400，将用于实现上述各种功能的信息存储在用于由计算机 1200 读取的存储信息内。

计算机 1200，在结构上包含用于通过通信线路 1300 与其他处理装置 1100 进行通信的发送接收部 1230、存储各种数据和程序等的存储部 1240、进行图象处理等的处理部 1250、进行图象显示等数据的再生的再生部 1220、从信息存储媒体 1400 读取信息的信息读取部 1290。

作为上述各部的硬件结构，例如，作为发送接收部 1230，可采用具有 IEEE1394 接口的通信设备、ATM 交换机等，作为存储部 1240，可采用 ROM、RAM 等，作为再生部 1220，可采用显示器、投影设备等，作为处理部 1250，可采用 CPU、图象处理用处理器等。

另外，作为信息存储媒体 1400，例如可以采用由激光读取信息的 CDROM 或 DVDROM 等、借助于磁性读取信息的硬盘、或存储器等。

此外，也可以不是将信息存储媒体 1400 直接连接于信息读取部 1290，而是由计算机 1200 通过通信线路 1300 下载和读取服务装置内的存储信息 1410。

另外，作为传输线路即通信线路 1300，例如可以采用 IEEE1394 总线、光纤等。

这里，例如当实现上述的日志功能时，存储信息 1410，是从多个处理装置 1100 通过传输线路即通信线路 1300 接收传送数据并生成反映该传送数据的会议数据的信息，该信息在结构上包含演示用信息、用于一边按上述每个处理装置 1100 管理上述传送数据一边将其存储在存储部 1240 内的存储用信息、用于根据会议参加者的再生指示从存储部 1240 读出包含着上述传送数据及上述演示用信息的至少一部分的会议数据的读出用信息。

按照这种方式，会议参加者，可以根据指示立即重放过去的会议数据。

另外，上述读出用信息，最好是包含用于根据再生指示按每个处理装置 1100 读出存储在存储部 1240 内的上述会议数据的信息。

按照这种方式，可以判别出从哪个处理装置 1100 接收到什么样的传送数据。

另外，也可以对反映每个处理装置 1100 的传送数据的会议数据进行再生。具体地说，例如，当多个会议参加者使用其各自的输入装置传送输入数据时，可以按每个输入装置、即每个会议参加者进行重放。

另外，最好是，存储信息 1410 包含用于对会议情况进行摄像的信息，上述存储用信息包含用于按规定单位将摄像数据作为上述会议数据的一部分存储在存储部 1240 内的信息，上述读出用信息包含用于根据上述再生指示按上述每个规定单位读出存储在存储部 1240 内的上述会议数据的信息。

按照这种方式，可以立即对会议情况的摄像结果进行再生。由于在摄像对象中不仅包含所再生的演示数据，而且还包含演示者的动作，所以能够适当地掌握会议情况。

同样，最好是，存储信息 1410 包含用于对会议情况进行录音的录音用信息，上述存储用信息，按规定单位将录音数据作为上述会议数据的一部分存储在上述存储装置内。

按照这种方式，由于还可以将声音合在一起进行再生，所以能够进一步适当地掌握会议情况。

这里，作为上述的规定单位，例如可以采用章单位、节单位、页单位等。即，例如，如果会议参加者发出第 3 章第 2 节部分的再生指示，则可以立即对该部分进行重放。

另外，存储信息 1410，最好还包含用于对上述读出的信息进行再生的信息。

按照这种方式，通过显示、投影、声音再生等对读出的会议数据进行再生，从而使会议参加者可以立即确认会议数据。

另外，存储信息 1410，最好还包含用于将上述的读出信息向处理装置 1100 传输的信息。

按照这种方式，可以用例如显示装置、打印装置等处理装置 1100 执行对会议数据的再生、打印等。

另外，为了提高上述的相互连接性，可以按如下的方式构成存储信息 1400.

例如，将存储信息 1410 构成为包含用于安装虚拟机 500 并由虚拟机 500 解释接收到的传送数据的解释用信息及用于根据该解释结果生成上述会议数据的生成用信息。

按照这种方式，通过采用将传送数据的形式通用化并变换为可由装置本身解释该传送数据的虚拟机 500，很容易进行处理装置间 1100 及计算机 1200 间的数据交换。由此，可以实现能灵活更换各种处理装置的会议系统。

另外，作为另一种结构，将存储信息 1410 构成为包含用于生成可由虚拟机 500 解释的传送数据的信息及用于传送所生成的的传送数据的信息。

按照这种方式，通过将传送数据的形式通用化并生成和传送可由其他处理装置 1100 中的虚拟机 500 解释的传送数据，使接收到该传送数据的处理装置无须考虑传送数据的传送装置的机型或制造厂商即可处理传送数据。因此，能使各处理装置 1100 间的数据交换易于进行。由此，可以实现能灵活更换各种处理装置 1100 的会议系统。

进一步，作为另一种结构，将存储信息 1410 构成为包含演示用信息、用于一边对包含着从具有多个输入装置的上述处理装置传送的上述输入数据的已进行过上述解释的状态的传送数据按上述每个输入装置进行管理一边将其存储在存储装置内的存储用信息、及用于根据再生指示从上述存储装置再生包含着上述输入数据及上述演示用信息的至少一部分的会议数据的再生用信息。

按照这种方式，会议参加者，可以根据指示立即过去的会议数据进行重放。

另外，最好是，上述存储用信息，包含用于一边对包含着上述输入数据的已进行过上述解释的状态的传送数据按每个处理装置 1100 进行管理一边将其存储在存储部 1240 内的信息，上述再生用信息，包含用于根据上述再生指示按上述每个处理装置从上述存储装置再生包含着上述传送数据及上述演示用信息的至少一部分的会议数据的再生用信息。

按照这种方式，会议参加者，通过发出按每个处理装置对过去的

会议数据进行再生的指示，可以按每个处理装置 1100 进行重放。

具体地说，例如，当多个会议参加者使用其各自的输入装置传送输入数据时，可以按每个输入装置、即每个会议参加者进行重放。

另外，最好是，存储信息 1410 包含用于对会议情况进行摄像的信息，上述存储用信息包含用于按规定单位将包含摄像结果的上述传送数据存储在存储部 1410 内的信息，上述再生用信息包含用于根据上述再生指示按上述每个规定单位再生存储在存储部 1410 内的包含上述摄像结果的传送数据。

按照这种方式，可以立即对会议情况的摄像结果进行再生。由于在摄像对象中不仅包含所再生的演示数据，而且还包含演示者指示的图象等附加信息，所以能够适当地掌握会议情况。

另外，这里，作为上述的规定单位，例如可以采用章单位、节单位、页单位等。即，例如，如果会议参加者发出第 3 章第 2 节部分的再生指示，则可以立即对该部分进行重放。

另外，上述传送数据，最好包含图象数据、图象生成用对象、图象生成控制用对象、图象显示用对象、图象显示控制用对象中的至少一种。

按照这种方式，可以实现能够有效地交换会议中使用的各种数据的会议系统。

另外，上述传输线路，最好在结构上包含 IEEE1394 总线。

按照这种方式，可以在各处理装置之间高速地交换传送数据等。特别是，虽然图象数据等传输数据量很大，但通过采用 IEEE1394 总线而仍能很容易地进行实时处理。

以上是用于提高相互连接性的存储信息 1410 的结构，以下，说明用于提高分散处理的数据处理效率的存储信息 1410 的结构。

例如，将存储信息 1410 构成为用于一边在通过传输线路即通信线路 1300 连接的多个处理装置 1100 之间发送和接收可由虚拟机 500 解释的通用形式的传送数据并进行分散处理一边生成会议数据的信息，并使该信息包含用于安装与其他处理装置 1100 共享存储部 1240 用的通信用接口部 30 的信息。

按照这种方式，可以提供可由各处理装置 1100 访问的存储部 1240。由于实现这种存储方式，所以在分散处理中是特别有效的。

这里，上述传输线路，最好是 IEEE1394 总线，上述通信用接口部，最好是 IEEE1394 总线接口。

按照这种方式，可以使各处理装置 1100 就好像访问自身装置的存储区域一样高速地访问该共享的存储部 1240.

另外，作为另一种结构，将存储信息 1410 构成为用于一边在通过传输线路即通信线路1300连接的多个处理装置1100之间发送和接收可由虚拟机 500 解释的通用形式的传送数据并进行分散处理一边生成会议数据的信息，该信息在结构上包含用于生成上述通用形式的传送数据的信息、及用于向具有可由各处理装置 1100 访问的存储部的至少 1 个处理装置 1100 发送所生成的上述传送数据的信息。

按照这种方式，通过生成通用形式的传送数据并存储在共享形态的存储装置内，使各处理装置可以访问该存储部并取得传送数据，因而在分散处理中是特别有效的。

例如，在将 JAVA 小应用程序用作传送数据时，可以使多个处理装置同时下载存储在存储装置内的 JAVA 小应用程序，并能够很容易地进行规格变更或功能扩展等。

这里，上述传输线路，最好是 IEEE1393 总线。

按照这种方式，可以使各处理装置就好像访问自身装置的存储区域一样高速地访问所共享的存储区域。

另外，作为另一种结构，最好将存储信息 1410 构成为用于一边在通过传输线路连接的多个处理装置 1100 之间发送和接收可由虚拟机 500 解释的通用形式的传送数据并进行分散处理一边再生会议数据的信息，并将其构成为包含用于对具有可由各处理装置 1100 访问并存储着上述会议数据的存储部的至少 1 个上述处理装置 1100 读取存储在上述存储部内的上述会议数据的读取用信息、及用于再生所读取的图象数据的再生用信息。

另外，其中，上述读取用信息，在结构上包含用于生成指示读取请求的传送数据并将其变换为上述通用形式的传送数据的信息、及用于向具有上述存储部的处理装置 1100 发送变换后的传送数据并从该处理装置 1100 接收包含着会议数据的传送数据的信息，上述再生用信息，在结构上包含用于安装虚拟机 500 的信息、及用于根据接收到的传送数据用虚拟机 500 变换传送数据并对会议数据进行再生的信

息。

按照这种方式，通过采用通用形式的传送数据，可以适应 OS 或制造厂商的不同并能接收和显示图象数据而无须考虑图象提供侧的装置类别。

另外，作为另一种结构，最好将存储信息 1410 构成为用于一边在通过传输线路连接的多个处理装置 1100 之间发送和接收可由虚拟机 500 解释的通用形式的传送数据并进行分散处理一边生成会议数据的信息，并使其包含用于对其他处理装置 1100 请求规定的服务的请求用信息、及用于向其他处理装置 1100 提供规定的服务的提供用信息。

其中，上述请求用信息，包含用于生成指示上述规定的服务请求的传送数据并将其变换为上述通用形式的传送数据的信息、及用于向其他处理装置发送变换后的传送数据的信息，上述提供用信息，包含用于安装虚拟机 500 的信息、用于从其他处理装置接收指示服务请求的传送数据并用虚拟机 500 加以变换的信息、用于根据变换后的传送数据判断是否可以提供该项服务的信息、及当可以提供该项服务时用于提供该项服务的信息。

按照这种方式，可以使各处理装置一边相互交换信息一边以分担的方式进行图象处理。例如，如果由投影机请求打印服务，则可提供打印服务的打印机响应该请求而进行打印。

这种分散处理，也可以通过采用虚拟机 500 并使传送数据为通用形式从而简化各处理装置 1100 之间的数据交换来实现。

另外，上述传送数据，最好是包含会议数据、会议数据生成用对象、会议数据生成控制用对象、会议数据再生用对象、会议数据再生控制用对象中的至少一种。

按照这种方式，由于这些数据或对象已统一为通用形式，所以可以提高分散处理中的各种图象处理的通用性。

另外，上述传输线路，在结构上最好是包含 IEEE1304 总线。

按照这种方式，可以使各处理装置 1100 就好像访问自身装置的存储区域一样高速地访问所共享的上述存储装置。此外，还可以使各处理装置以高速进行上述的信息交换，因而能提高处理速度。

（变形例）

本发明的应用并不限于上述的实施例，可以应用于各种变形例。

例如，作为上述传输线路，说明了采用了 IEEE1394 总线 300 的实施例，但只要是高速传输线路则可以采用各种形式。具体地说，例如，可以采用光线信道或卫星通信线路等。

另外，在上述实施例中，说明了采用 2 个会议数据再生装置（液晶投影机 200）的分散处理，但采用 2 个会议数据生成装置、或 1 个会议数据生成装置和 1 个会议数据再生装置进行分散处理，也包括在本发明的应用范围内。

另外，作为演示中使用的数据，主要是所采集的声音、作为声音识别结果而得到的字符代码、在图形输入板等数字化装置上通过手写字符识别而得到的字符代码等二次信息的附加。对于这些识别处理，如采用在信息处理系统的运算功能上优越的 DSF（Digital Signal Processor;数字信号处理器），则可以实现高速的处理。从上述实施例可以清楚地看出，本发明的分散处理，基于虚拟机接口之间的通信及独立的处理分散。

如果是在现有的方式下，则为了使用 DSP，必须使应用软件（应用层程序）生成 DSP 所固有的特殊机器语言并由 DSP 系统传送和执行。但是，如采用本发明，则可以在通过 IEEE1394 总线连接的 DSP 系统上安装虚拟机解释程序，并应用于处理分散。其结果是，可以使用 DSP 的优异计算能力资源，而无须重写作为应用层程序的原始演示文件。

进一步，如上所述，用于实现本发明的程序语言，不限于 JAVA。存在着多种可以生成虚拟机的机器语言并能以上述机器语言级支持对处理器资源进行多路复用处理的语言。在这种语言中，可以进行与本发明中的上述绘图命令的记述相同的记述。本发明，可以使用不依赖于可达到用来生成绘图命令字的程度的高级语言级的句法词法分析规格的各种语言实现。

产业上的可应用性

本发明，可以应用于演示者用个人计算机和投影机对听众进行演示时适用的会议系统。

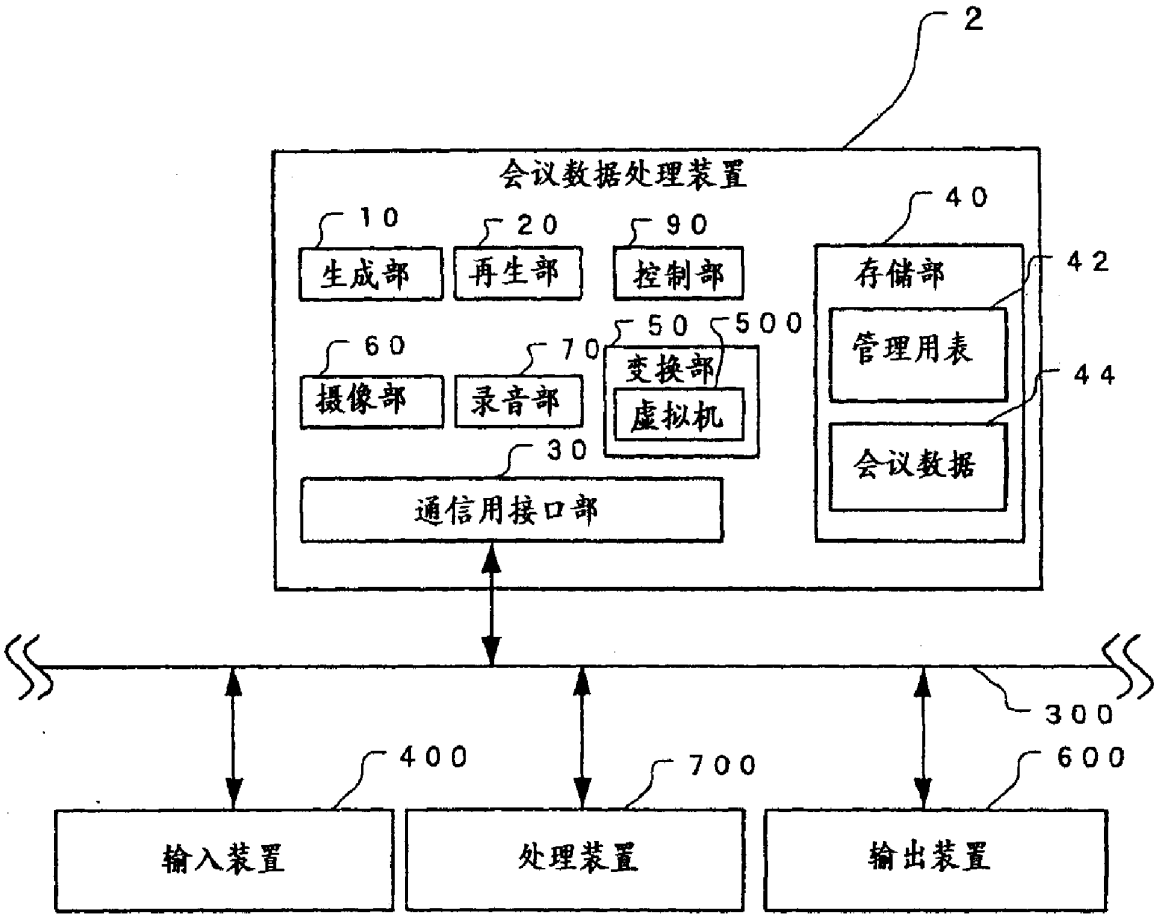

2
会议数据处理装置
10
生成部
20
再生部
90
控制部
40
存储部
42
管理用表
44
会议数据
50
500
变换部
虚拟机
60
摄像部
70
录音部
30
通信用接口部
300
400
700
600
输入装置
处理装置
输出装置

图 1

01-03-06

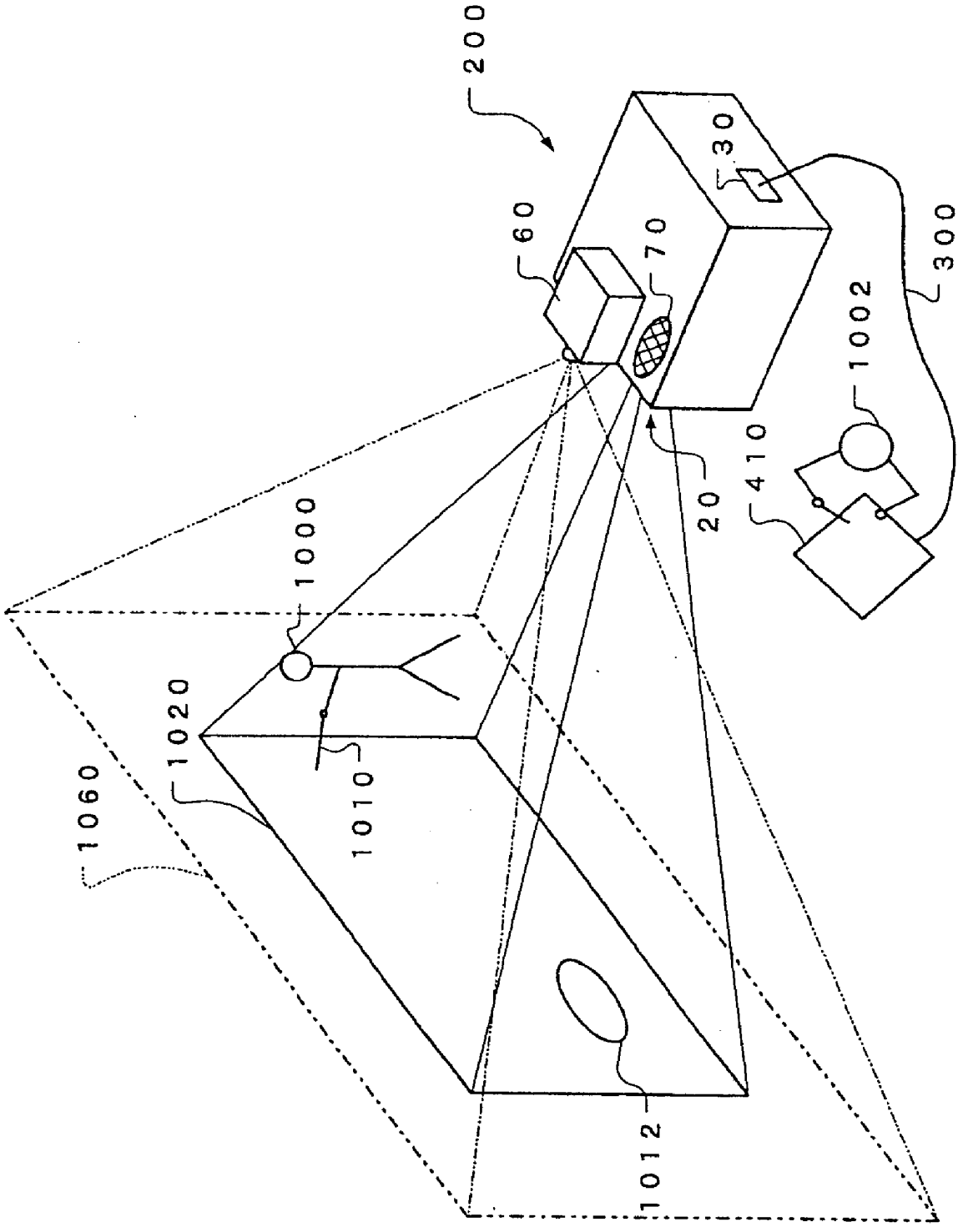


図2

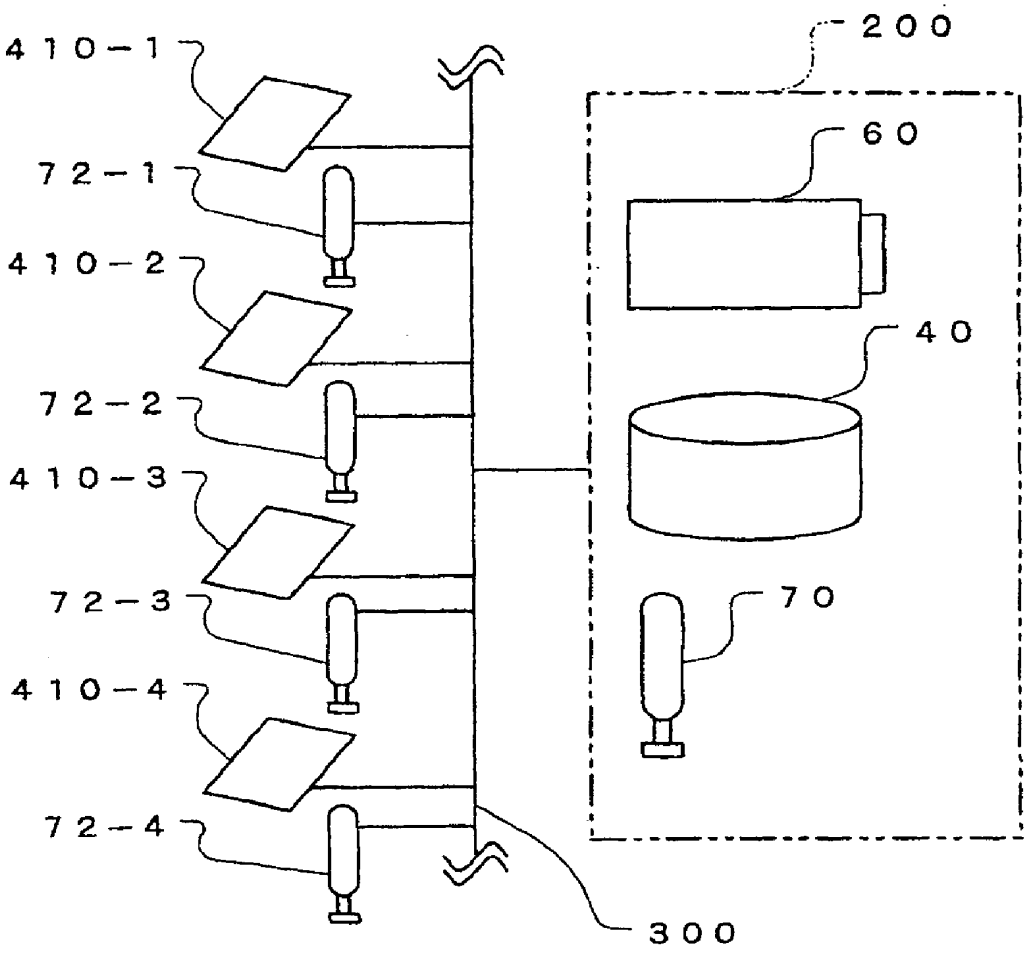


图 3

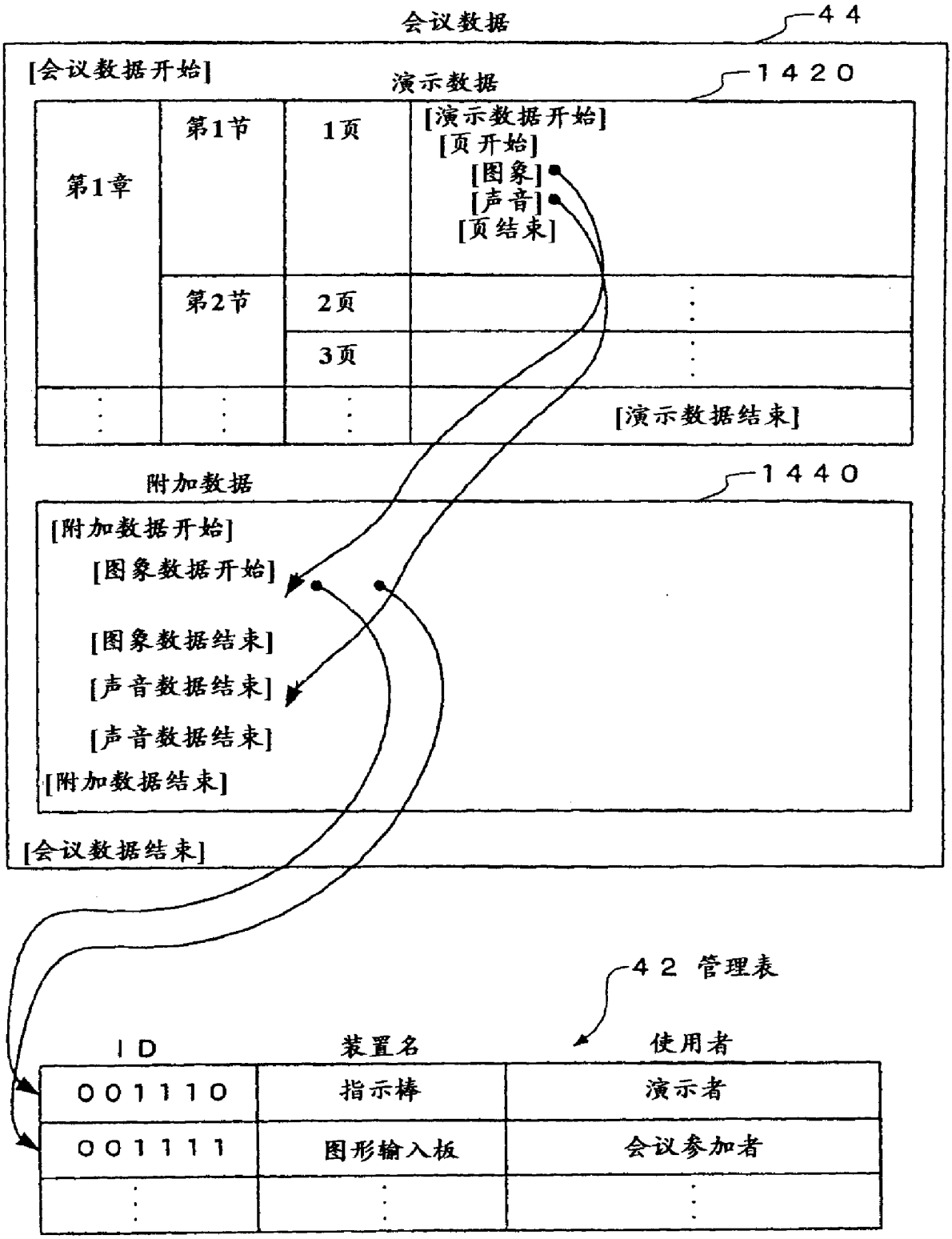

会议数据
44
[会议数据开始]
演示数据
1420
第1章
第1节
1页
[演示数据开始]
[页开始]
[图象]
[声音]
[页结束]
第2节
2页
3页
[演示数据结束]
附加数据
1440
[附加数据开始]
[图象数据开始]
[图象数据结束]
[声音数据结束]
[声音数据结束]
[附加数据结束]
[会议数据结束]
42 管理表
ID
装置名
使用者
001110
指示棒
演示者
001111
图形输入板
会议参加者

图 4

01.03.06

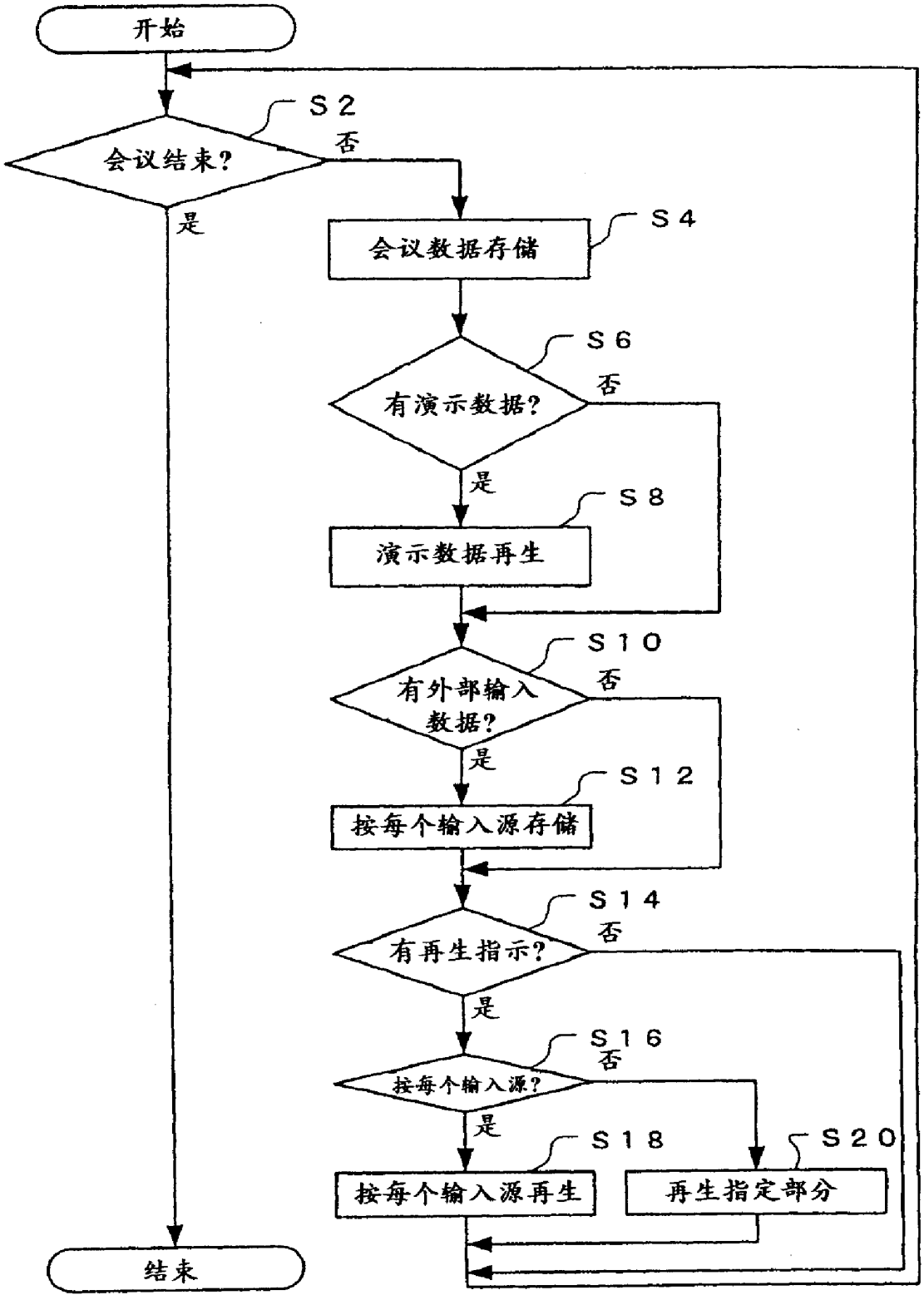

开始
S2
会议结束?
否
是
S4
会议数据存储
S6
有演示数据?
否
是
S8
演示数据再生
S10
有外部输入数据?
否
是
S12
按每个输入源存储
S14
有再生指示?
否
是
S16
按每个输入源?
否
是
S18
按每个输入源再生
S20
再生指定部分
结束

图 5

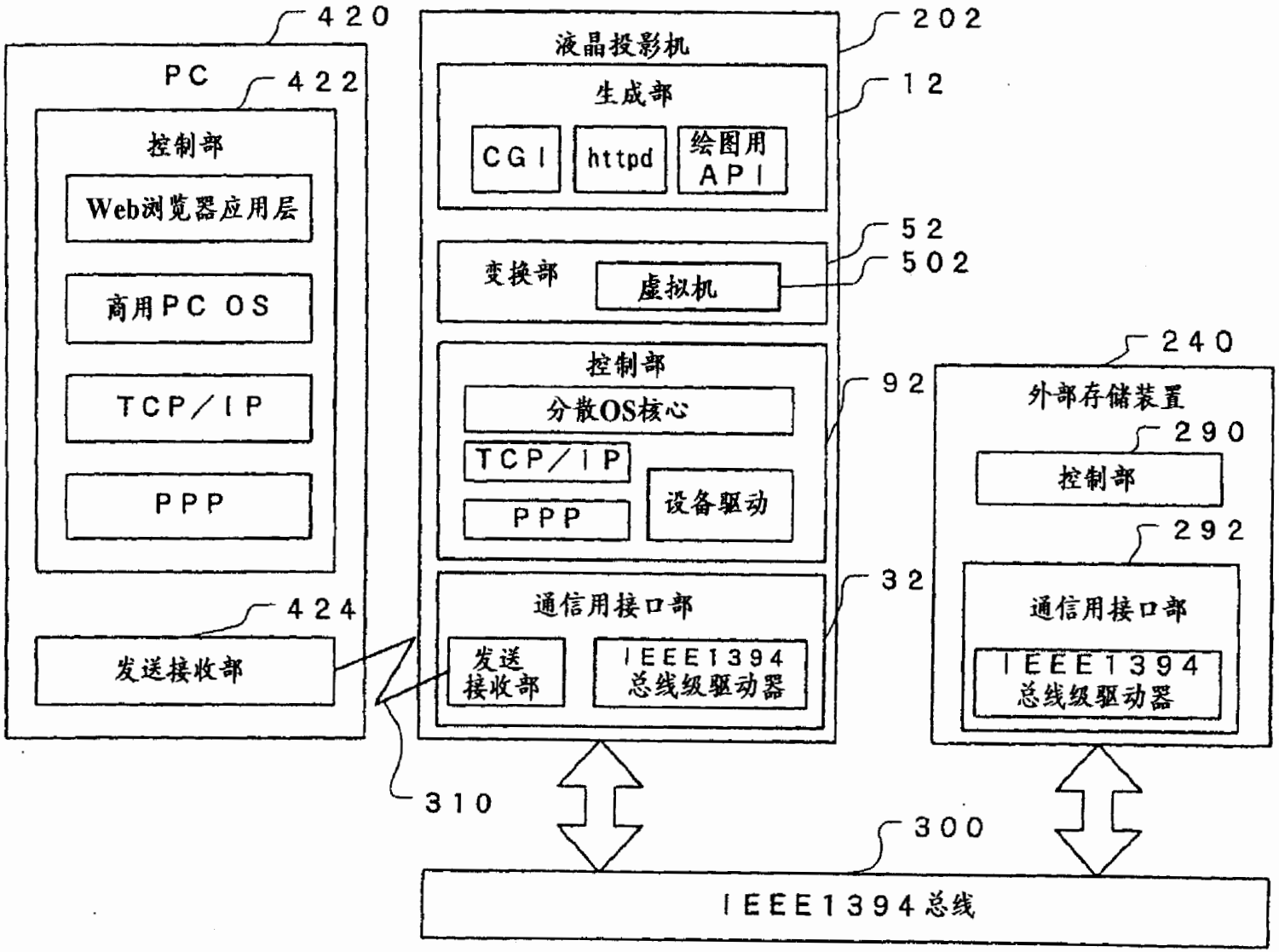

420
PC
422
控制部
Web浏览器应用层
商用PC OS
TCP/IP
PPP
424
发送接收部
液晶投影机
202
生成部
12
CGI
httpd
绘图用API
52
变换部
502
虚拟机
控制部
92
分散OS核心
TCP/IP
PPP
设备驱动
通信用接口部
32
发送接收部
IEEE1394总线级驱动器
310
240
外部存储装置
290
控制部
292
通信用接口部
IEEE1394总线级驱动器
300
IEEE1394总线

图 6

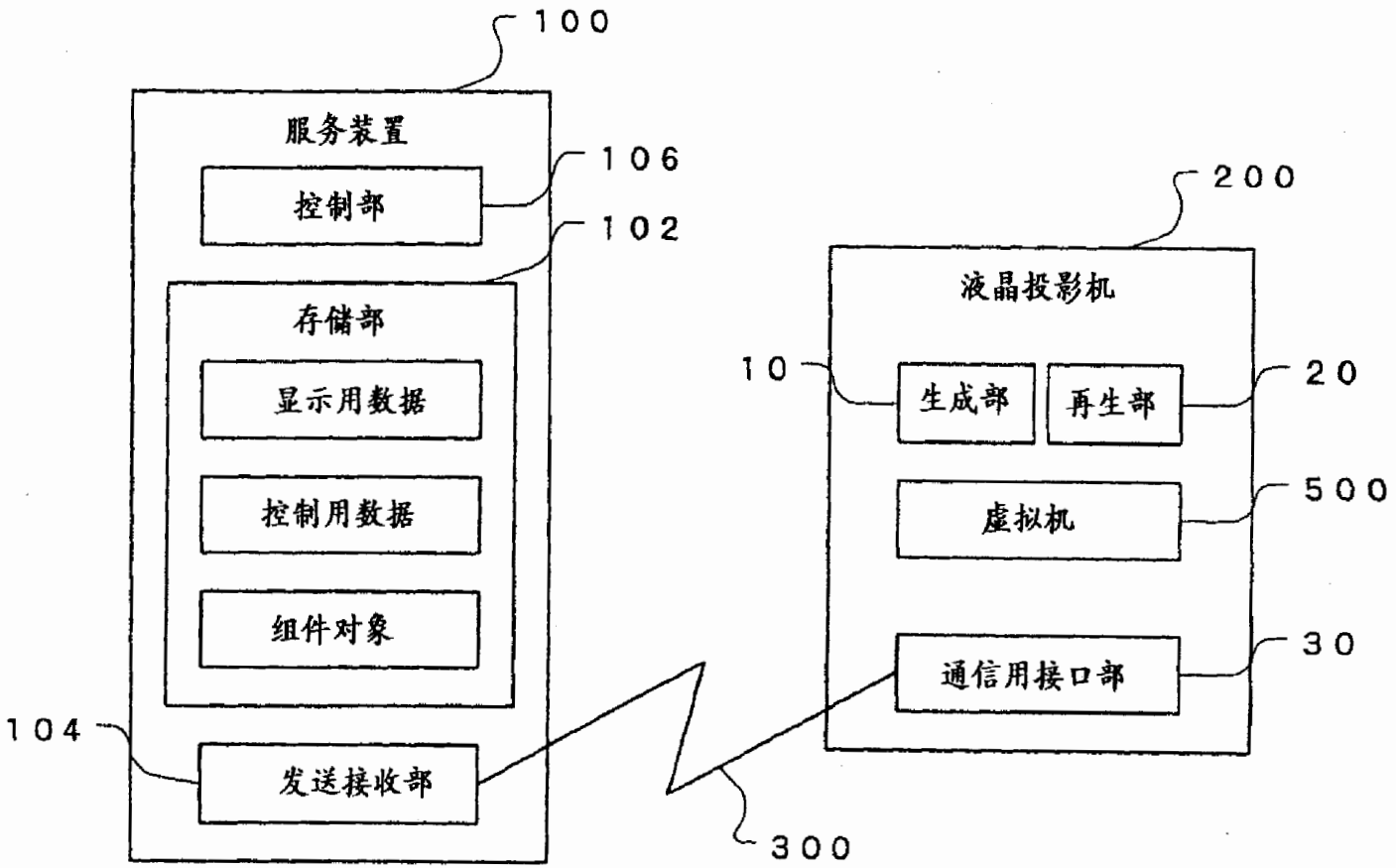

100
服务装置
106
控制部
102
存储部
显示用数据
控制用数据
组件对象
104
发送接收部
300
200
液晶投影机
10
生成部
再生部
20
500
虚拟机
30
通信用接口部

图 7

01-03-05

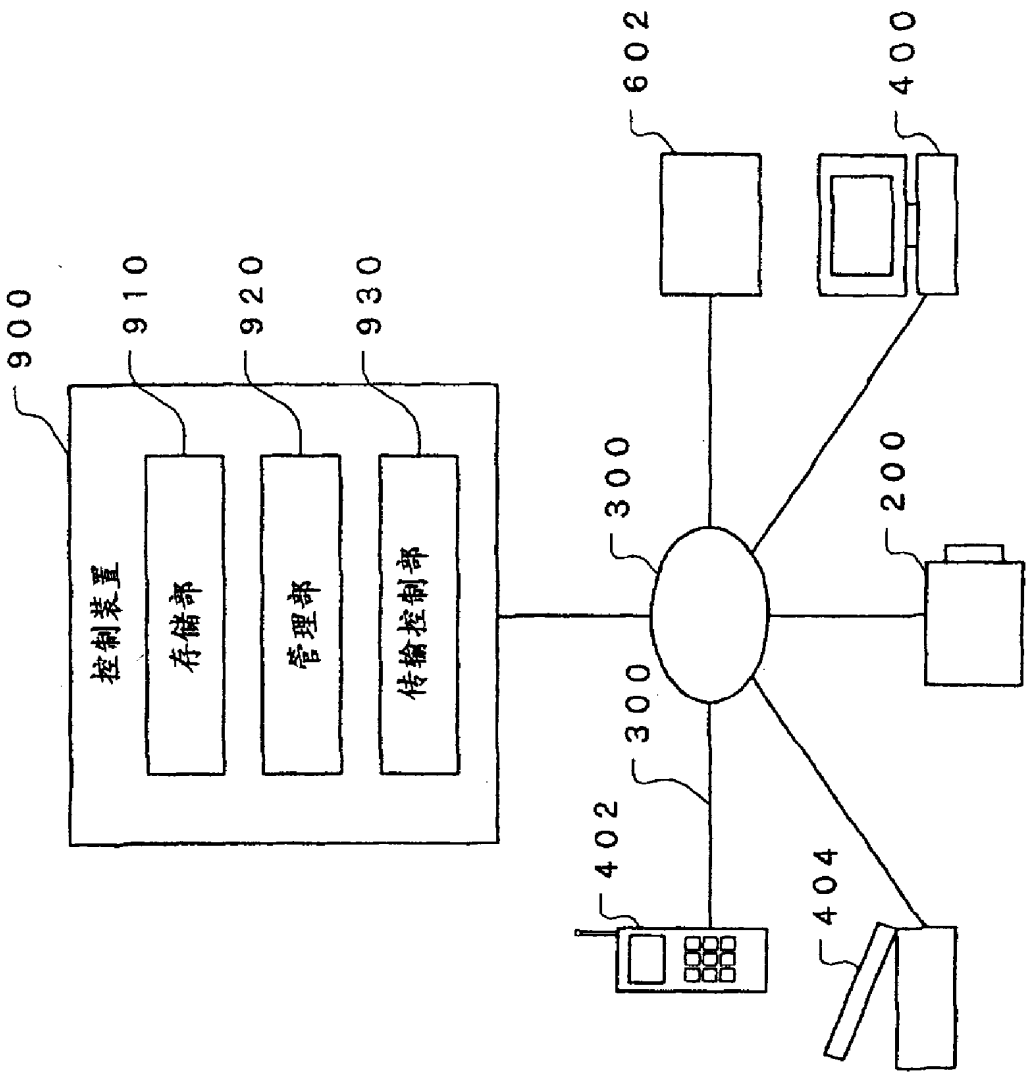


图 8

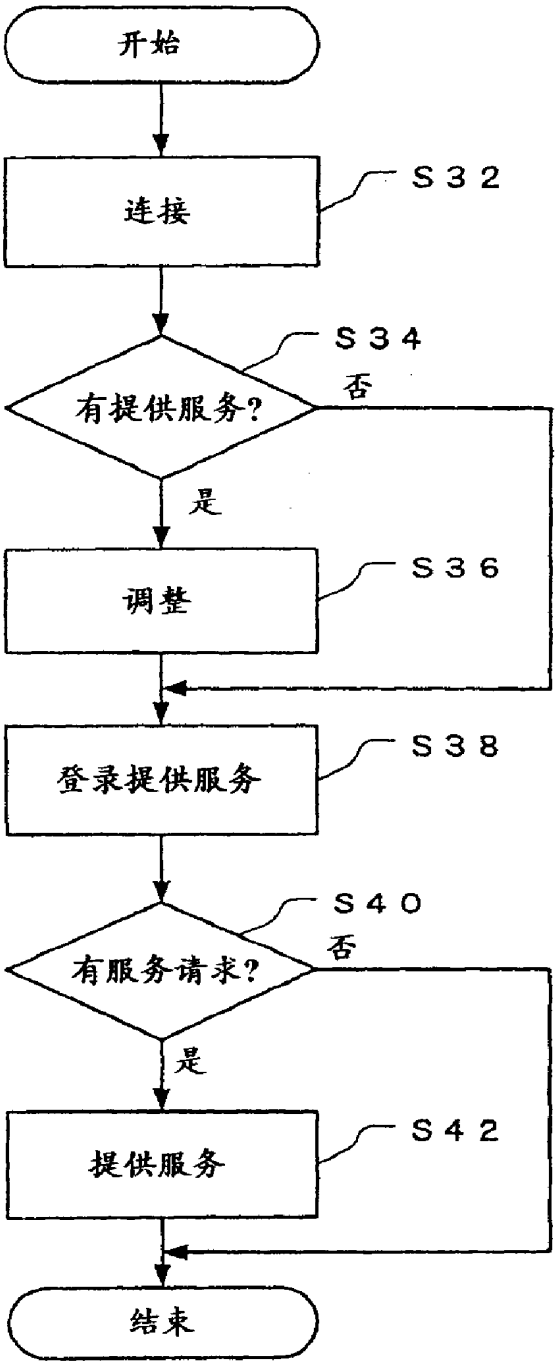

开始
连接
S32
S34
有提供服务?
否
是
调整
S36
登录提供服务
S38
S40
有服务请求?
否
是
提供服务
S42
结束

图 9

912

ID	提供服务	状态
…005	命令	可执行
…004	二维数据及三维数据的读取	执行中
…001	投影	执行中
…002	命令、运算、显示	不可执行
…003	打印	等待执行
⋮	⋮	⋮

图 10

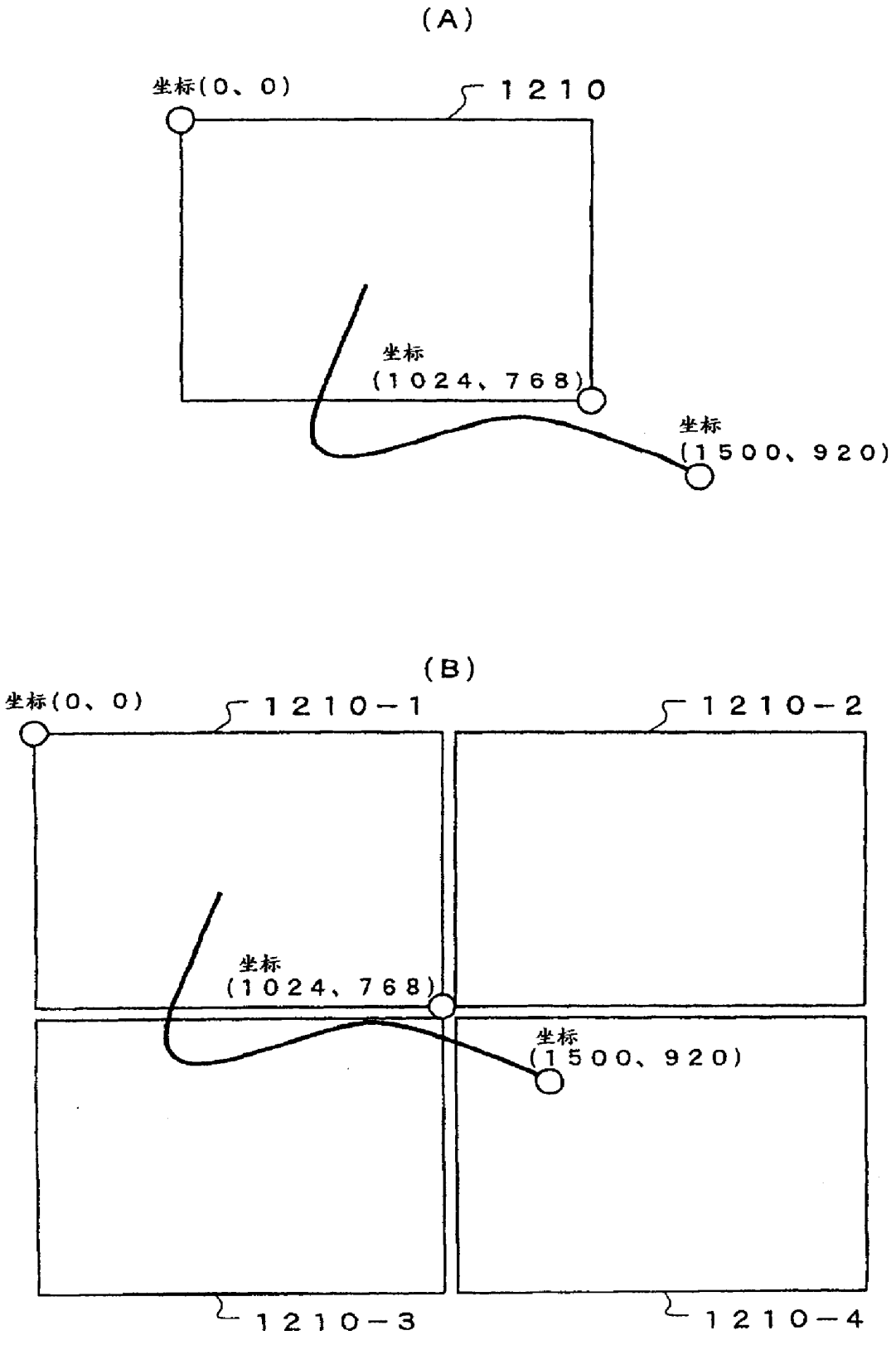

(A)
坐标(0、0)
1210
坐标
(1024、768)
坐标
(1500、920)
(B)
坐标(0、0)
1210-1
1210-2
坐标
(1024、768)
坐标
(1500、920)
1210-3
1210-4

图 11

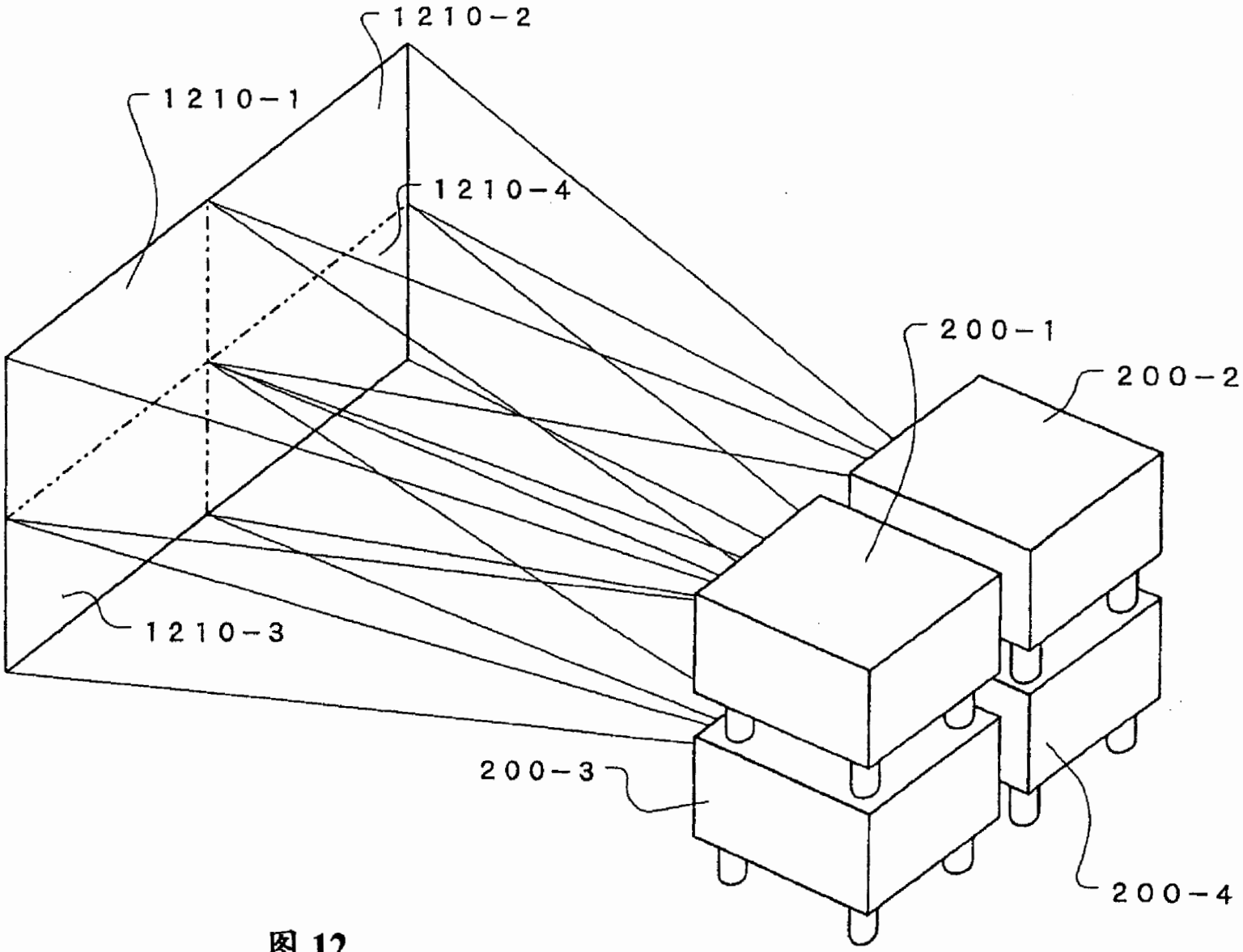


图 12

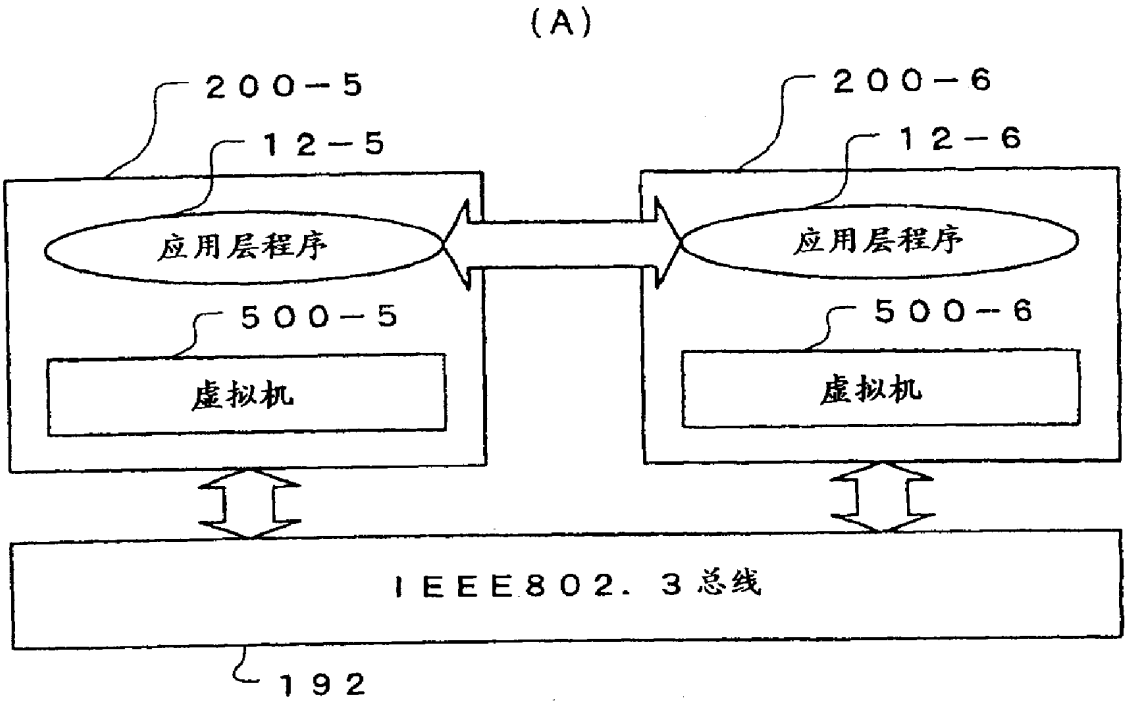

(A)
200－5
12－5
应用层程序
500－5
虚拟机
200－6
12－6
应用层程序
500－6
虚拟机
IEEE802．3总线
192
(B)
200－1
12－1
应用层程序
500－1
虚拟机
200－2
12－2
应用层程序
500－2
虚拟机
IEEE1394总线
300

图 13

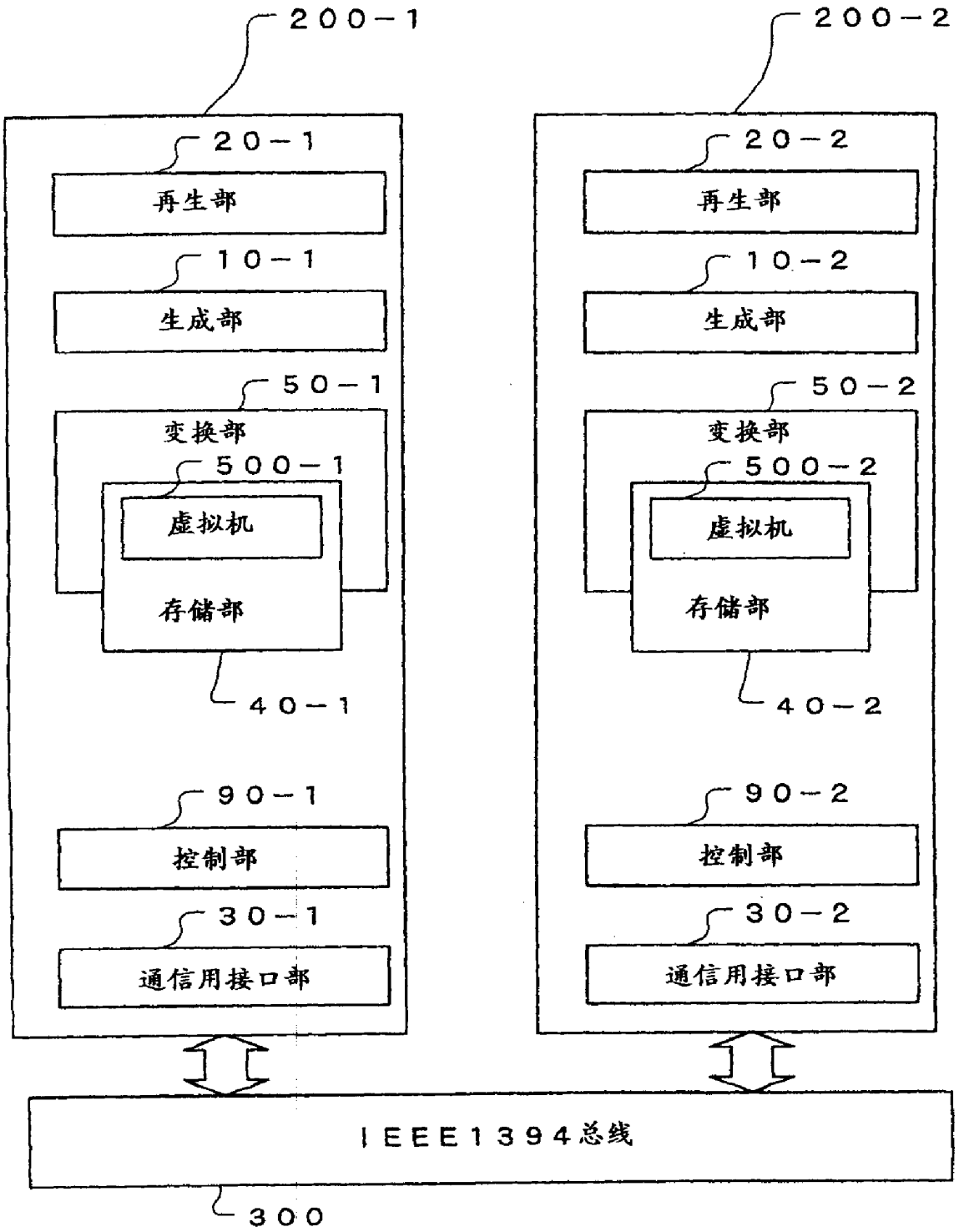

200－1
200－2
20－1
再生部
10－1
生成部
50－1
变换部
500－1
虚拟机
存储部
40－1
90－1
控制部
30－1
通信用接口部
20－2
再生部
10－2
生成部
50－2
变换部
500－2
虚拟机
存储部
40－2
90－2
控制部
30－2
通信用接口部
IEEE1394总线
300

图 14

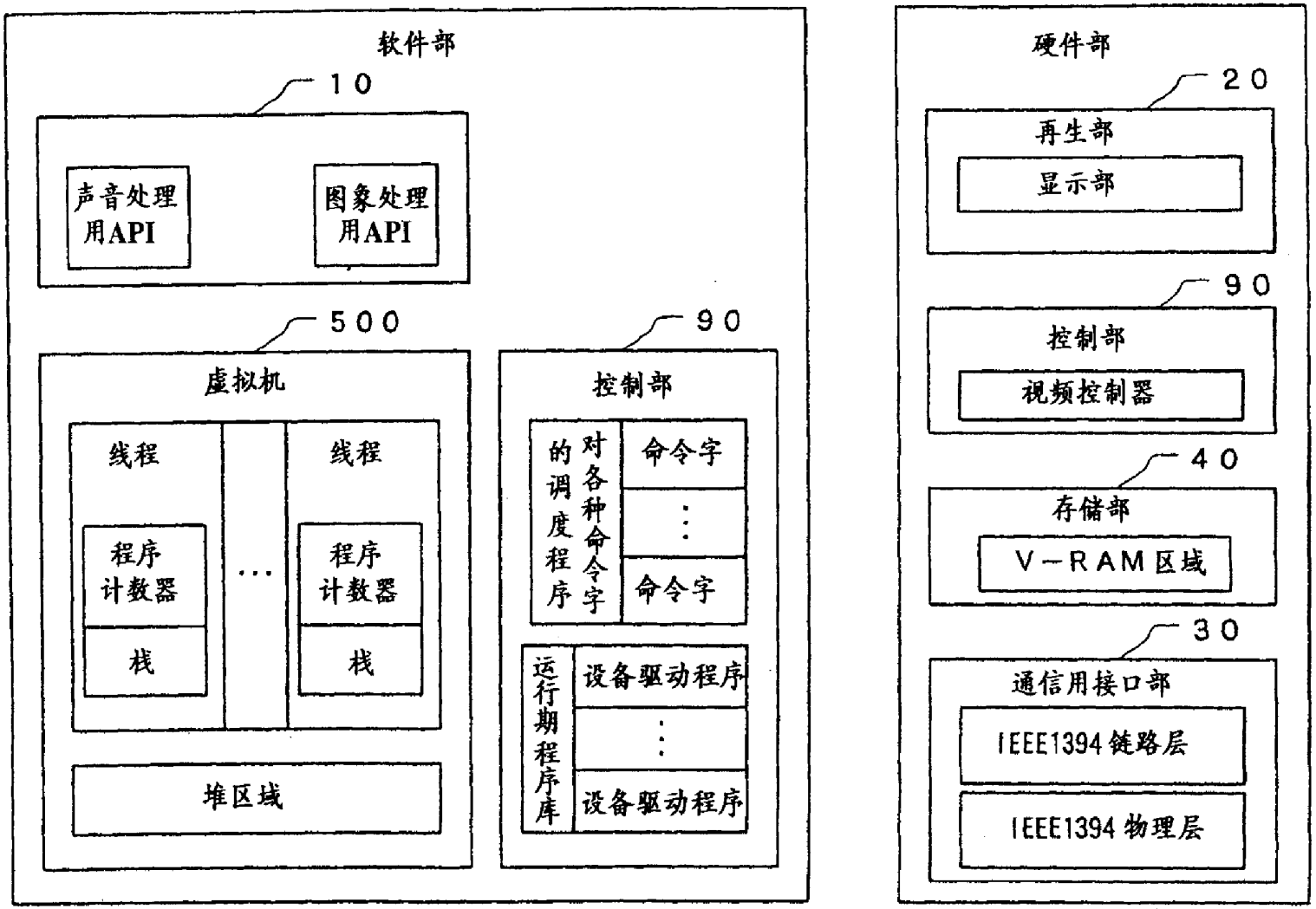

软件部
10
声音处理用API
图象处理用API
500
虚拟机
线程
程序计数器
栈
线程
程序计数器
栈
堆区域
90
控制部
对各种命令字的调度程序
命令字
命令字
运行期程序库
设备驱动程序
设备驱动程序
硬件部
20
再生部
显示部
90
控制部
视频控制器
40
存储部
V-RAM区域
30
通信用接口部
IEEE1394链路层
IEEE1394物理层

图 15

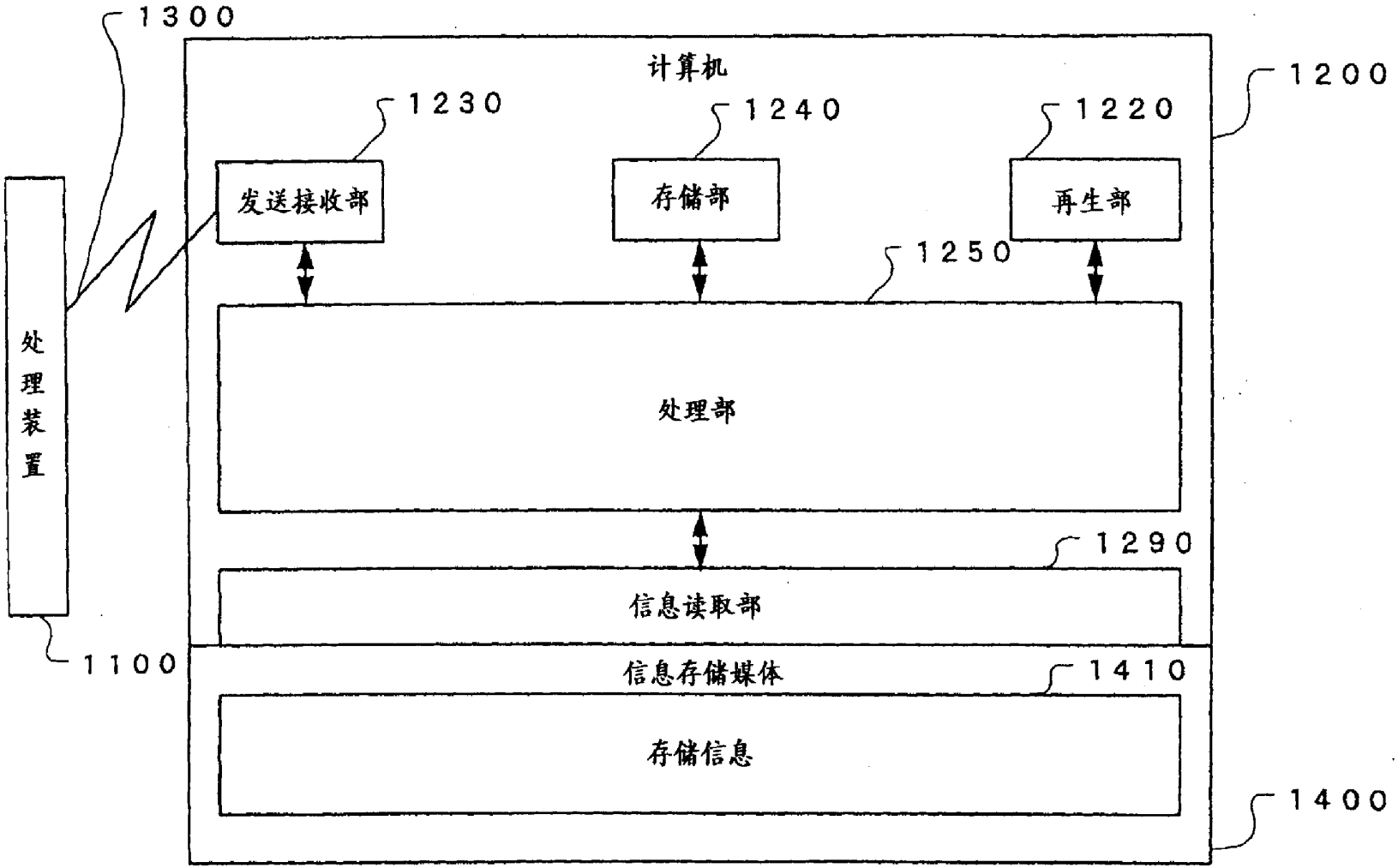

1300
计算机
1200
1230
1240
1220
发送接收部
存储部
再生部
1250
处理装置
处理部
1290
信息读取部
1100
信息存储媒体
1410
存储信息
1400

图 16

CN1317112A Meeting system and information storage medium

Data originating from sources other than the EPO may not be accurate, complete, or up to date.

The wording below is an initial machine translation of the original publication. To generate a version using the latest translation technology, go to the original language text and use Patent Translate.

Technical field

The present invention relates to a conference system and a conference information storage medium. Background technique

In the existing conference system, when the presentation is performed, the presenter uses a personal computer and a projector to demonstrate the audience at a certain venue.

However, in fact, in some cases, it is not only this one-way presentation, but the presenter who allows multiple people to write to the presentation screen or replay when the screen is written. Two-way communication with the demo recipient.

As a method of such playback, although a method of photographing and reproducing using a video recording device is also conceivable, in order to reproduce a scene in a conference or a portion such as a chapter in a presentation, it is necessary to perform reverse playback or Quick release, so lack of speed.

Further, if only the presentation data, that is, the data generated by the application software is used in advance, the reproduction of a part of the above is relatively easy, but it is practically impossible to reproduce the scene at the time of the presentation, for example, the operation of the pointing stick. Disclosure of invention

The present invention has been made in view of the above problems, and an object thereof is to provide a conference system and an information storage medium capable of immediately reproducing a past conference situation in accordance with an instruction.

In order to solve the above problems, a conference system of the present invention includes conference data generating apparatus that receives transmission data from a plurality of data transmission apparatuses via a transmission line and generates conference data reflecting the transmission data, and the conference system is characterized in that the conference data is generated. The apparatus includes, for storing the received transmission data for each of the data transfer devices, and storing the received transfer data in the storage device storing the predetermined presentation data and storing the storage from the storage device according to the regeneration instruction of each of the data transfer devices The device reads out data control means including conference data of at least a part of the transmission data and the presentation data.

In this way, the conference participant or the like can immediately replay the past conference data according to the instruction.

Further, by storing while managing each data transfer device, it is possible to determine from which data transfer device what transfer data is received.

Further, it is also possible to reproduce the conference data reflecting the transmission data of each data transmission device. Specifically, for example, when a plurality of conference participants transmit input data by their respective input devices, playback can be performed for each input device, that is, for each conference participant.

Here, as the reproduction instruction, specifically, for example, a reproduction instruction issued by a conference participant or a presenter by a predetermined reproduction instruction device may be used.

Further, it is preferable that the data control device stores the received transmission data while managing the predetermined transmission unit, and reads the conference data for each predetermined unit based on the reproduction instruction.

Here, as the predetermined unit, for example, a chapter unit, a unit of a chapter, a page unit, or the like can be used. That is, for example, if the conference participant issues a reproduction instruction in the second section of Chapter 3, the portion can be immediately reproduced.

Further, preferably, the conference data generating device includes an imaging device for imaging a conference situation, and the data control device stores the imaging data as the part of the conference data in the predetermined unit for each of the storage devices. The data control device reads the conference data stored in the storage device for each of the predetermined units in accordance with the reproduction instruction.

Here, as the meeting situation, for example, an image displayed by the narrator (presenter) or the conference participant with a pointing stick, a laser pointer or a finger on the front of the screen or on the tablet, an image reflecting the instructions, and the like may be used.

In other words, since the image to be captured includes not only the reproduced presentation data but also an image reflecting the instruction of the conference participant, the indication position and the instruction content can be immediately reproduced based on the imaging result, and the conference can be appropriately grasped. The meeting between the narrator and the conference participants to discuss each other.

Similarly, it is preferable to include a recording device for recording a conference situation, and the data control device stores the recorded data in the storage device as a part of the conference data for each predetermined unit.

Here, as the meeting situation, for example, it may be a speech or a conversation of a narrator or a conference participant. In this way, since the sounds can be combined and reproduced, it is possible to further appropriately grasp the situation of the meeting.

Preferably, the conference data generating device includes a playback device for reproducing the read conference data.

In this manner, the read conference data can be reproduced by display, projection, sound reproduction, etc., thereby enabling the conference participant to immediately confirm the conference data.

Preferably, the conference data generating device includes a transmission device for transmitting the read conference data to another processing device.

In this manner, reproduction, printing, and the like of the conference data can be performed by other processing means such as a display device, a printing device, or the like.

Preferably, the data transfer device includes a plurality of input devices, and the data control device preferably stores the transfer data transmitted from the input device for each of the input devices while storing the transfer data in the storage device. The conference data is read from the storage device in accordance with the above-described playback instruction.

In this way, playback can be performed for each input device, i.e., for each conference participant. Specifically, for example, it is possible to reproduce the conference data reflecting the data input by the conference participant using a mouse or a pen tablet, and to immediately confirm who performed what kind of operation.

Here, it is preferable that the conference data generating device includes a projector.

In this way, by using the projector, it is possible to realize a conference system that can be adapted even for a large conference.

Further, the information storage medium of the present invention stores information for receiving transmission data from a plurality of data transmission apparatuses via a transmission line and generating conference data reflecting the transmission data, and is readable by a computer, and the above information preferably includes a presentation. Information for storing storage information stored in the storage device while managing the transmission data by each of the data transfer devices, and for reading the transfer data and the presentation for the presentation from the storage device according to the playback instruction Information for reading the conference data of at least a part of the information.

According to the present invention, the conference participant can immediately replay the past conference data in accordance with the instruction.

Further, it is preferable that the read information includes information for reading the conference data stored in the storage device for each of the data transfer devices in accordance with the playback instruction.

In this way, it is possible to discriminate from which data transmitting device what kind of transmission data is received.

In addition, it is also possible to reproduce the conference data reflecting the transmission data of each data transmission device. Specifically, for example, when a plurality of conference participants transmit input data using their respective input devices, playback can be performed for each input device, that is, for each conference participant.

Further, preferably, the information includes information for capturing a situation of the conference, and the storage information includes information for storing the image data as a part of the conference data in the storage device in a predetermined unit, wherein The read information includes information for reading the conference data stored in the storage device for each of the predetermined units in accordance with the reproduction instruction.

Here, as the meeting situation, for example, an image displayed by the narrator (presenter) or the conference participant with a pointing stick, a laser pointer or a finger on the front of the screen or on the tablet, an image reflecting the instructions, and the like may be used.

In other words, since the image to be captured includes not only the reproduced presentation data but also an image reflecting the instruction of the conference participant, the indication position and the instruction content can be immediately reproduced based on the imaging result, and the conference can be appropriately grasped. The meeting between the narrator and the conference participants to discuss each other.

Similarly, it is preferable to include recording information for recording a conference situation, and the storage information preferably includes storing the recorded data in the storage unit for each predetermined unit as part of the conference data. Information.

Here, as the meeting situation, for example, it may be a speech or a conversation of a narrator or a conference participant. In this way, since the sounds can be combined and reproduced, it is possible to further appropriately grasp the situation of the meeting.

Here, as the predetermined unit, for example, a chapter unit, a unit unit, a page unit, or the like can be used. That is, for example, if the conference participant issues a reproduction instruction in the second section of Chapter 3, the portion can be immediately reproduced.

Preferably, the above information includes information for reproducing the read information.

In this manner, the read conference data can be reproduced by display, projection, sound reproduction, etc., thereby enabling the conference participant to immediately confirm the conference data.

Preferably, the above information includes information for transmitting the read information to other processing devices.

In this manner, reproduction, printing, and the like of the conference data can be performed by other processing means such as a display device, a printing device, or the like. Brief description of the drawing

Fig. 1 is a schematic diagram of a conference system according to an example of the embodiment.

Fig. 2 is an explanatory diagram of a conference situation in an example of the embodiment.

Fig. 3 is a block diagram showing a configuration of a conference system according to an embodiment of the present invention.

4 is a schematic diagram showing an example of a data structure of a conference data and a management table according to the embodiment.

Fig. 5 is a flow chart showing the flow of processing in the conference system according to an example of the embodiment.

Fig. 6 is a functional block diagram of a conference system according to another example of the embodiment.

Fig. 7 is a functional block diagram of a conference system according to another example of the embodiment.

Figure 8 is a simplified diagram of a conference system employing a control device.

Fig. 9 is a flow chart showing the flow of processing in the conference system using the control device.

FIG. 10 is a diagram showing an example of a management table.

Fig. 11 is a view showing image display when image display is performed in a distributed manner, wherein (A) is a view showing an image display example when only one liquid crystal projector is used, and (B) is a view showing four liquid crystal projections. The image of the machine is shown in the figure.

Fig. 12 is a view showing a state in which image display is performed in a distributed manner using four liquid crystal projectors.

FIG. 13 is a schematic diagram showing a communication method when a virtual machine is used. (A) is a view showing a conventional communication method, and (B) is a view showing a communication method according to the present embodiment.

Fig. 14 is a functional block diagram at the time of performing the dispersion processing of the embodiment.

Fig. 15 is a functional block diagram of a software unit and a hardware unit in the projector.

Fig. 16 is a functional block diagram of an information storage medium according to an example of the embodiment. Best form for implementing the invention

[Embodiment of the Invention]

Hereinafter, a preferred embodiment of the conference system of the present embodiment will be described with reference to the drawings.

As the conference system of the present embodiment, for example, a conference system in which a plurality of display devices and input devices are connected by a communication line or a system bus having bidirectional connectivity is provided. More specifically, for example, there is a conference system in which a conference participant instructs the projection or display screen of the display device while another conference participant uses the input device to attach information to the image displayed on the screen. A conference system that can be used in a remote area even if it is used as a single system and that synchronizes the conference systems through communication paths, so that participants who are far apart can participate in the same conference to support the conference. System, etc.

(Note on the structure of the conference system)

Fig. 1 is a schematic diagram of a conference system according to an example of the embodiment.

As shown in FIG. 1, the conference system includes, in structure, an input device 400, an output device 600, and conference data having both functions as a conference data generating device for generating conference data and a function as a conference data reproducing device for reproducing conference data. The processing device 2 and the processing device 700 are connected to each other by an IEEE 1934 bus 300 which is a high speed transmission line.

The conference data processing device 2 performs transmission and reception of transmission data with the processing device 700 in addition to receiving transmission data from the input device 400, generating

conference data based on the transmission data, and transmitting the generated conference data to the output device 600.

Specifically, the input device 400 may be, for example, a tablet, a mouse, a keyboard, a scanner, a digital camera, a portable information terminal, a portable telephone, a pointing stick, or the like. The information (transmission data) transmitted from the input device 400 to the conference data processing device 2 may be, for example, coordinate information digitized by the tablet, and information obtained by digitizing the movement track of the pointer on the tablet. The information after the coordinate of the mouse device is coordinated, the text information input through the keyboard, the collected pixel information, the digitized sound information, and the like. Further, as the output device 600, for example, a display, a portable information terminal, a printer, or the like can be used.

Further, the conference data processing device 2 may be, for example, a liquid crystal projector or the like, and the processing device 700 may be, for example, a PC (Personal Computer), a WS (Workstation), an NC (Network Computer), a service device, a host device, or the like.

That is, these devices constitute a conference system in which a plurality of conference participants use at one site and generate and reproduce conference data by associating these devices with each other.

Further, the processing device 700 of a computer such as a PC is not a configuration necessary for the conference system, and as a component of the processing device 700, there are a processor, a ROM, a RAM, a secondary storage device, etc., but these elements can also be regarded as A part of the components of the conference data generating device. The processing device 700 is housed in another housing in consideration of the overall portability and reusability of the device, and thus the processing device 700 is described in a separate form.

The conference system is not only suitable for small meetings for meetings around a table, but also for meetings where multiple devices in remote areas are interconnected, such as meetings between countries.

First, an embodiment in a small conference centered on one liquid crystal projector will be described, and then an embodiment in a conference between distant regions in which a plurality of devices are associated will be described.

(Description of the meeting situation)

Fig. 2 is an explanatory diagram of a conference situation in an example of the embodiment.

Here, the conference data 44 shown in FIG. 1 is projected onto the screen 1020 by the liquid crystal projector 200 as the conference data processing device 2, and the presenter 1000 performs the presentation using the pointer 1010.

On the other hand, the conference participant 1002 inputs data using the tablet 410 as the input device 400. The input data is transmitted to the communication interface unit 30 of the liquid crystal projector 200 via the IEEE1394 bus 300, and the liquid crystal projector 200 projects the instruction data 1012 constituting a part of the conference data 44 based on the transmitted data.

Here, the instruction data 1012 may be, for example, character data in which a character is written on a part of the projected image, graphic data in which a graphic is written on a part of the projected image, and in the projected image. The underlined data of the underlined text, the circled data of a part of the projected image surrounded by a circle, and the like.

The conference participant 1002 can see the indication data 1012 input by the tablet 410 in addition to the presentation data.

In the case of an actual meeting, sometimes it is sometimes desirable to see the first few chapters of the specially designated demo data and also include the actions of the presenter 1000, or sometimes to confirm the meeting participants, even during the progress of the meeting. The location indicated by 1002, etc.

In this case, if you are using the demo data generated by the PC application and only the demo data, you can specify and regenerate the sections of the chapters. However, this method cannot reproduce the information and the additional time added by the conference participant 1002 with the tablet 410.

In addition, although it is possible to photograph and reproduce the entire conference using a video recording device or the like, it is necessary to take time to perform fast playback or reverse playback in order to specify the sections of the first chapter and reproduce them. When a conference participant is present, it is impossible to reproduce only the location indicated by the specific conference participant 1002.

If you can achieve the above ideas, you can effectively conduct meetings in a variety of ways.

In order to realize the above-described concept, as shown in FIG. 1, the liquid crystal projector 200 of the present embodiment records and digitizes a conversation in a conference by using an image captured by an image or the like instructed by a narrator or the like. The recording unit 70, the input device 400, and the like add information to the presentation data generated by the processing device 700 as the PC, and combine this information with the address assigned to each device and manage it by the management table 42 as the conference data 44. It is stored in the storage unit 40.

Hereinafter, the conference system of the present embodiment will be described more specifically.

Fig. 3 is a block diagram showing a configuration of a conference system according to an embodiment of the present invention.

As shown in FIG. 3, when the data input is performed by the conference participants 1001 to 4, respectively, by the conference participants 1002 of the four individuals, the input data is stored in the storage unit 40 for each of the graphics input boards 410.

Similarly, the speech of the presenter 1000 as the narrator is recorded by the recording unit 70, and the conversation or speech of the meeting participant 1002 is collected by the sound digitizing device 72 used as the recording device set for each meeting participant 1002, and The sound recording data is stored in the storage unit 40 in accordance with the presenter 1000 and each meeting participant 1002.

The recording unit 70, the audio digitizers 72-1 to 4, and the tablet 4101 to 4 are assigned device addresses that are not duplicated.

Further, part of the voice information is voice-recognized based on a predetermined keyword registered in advance. The voice recognition result is subjected to character code conversion and recorded as additional information to the conference data, or as a device control command. In the latter case, terms such as "fast release" and "reverse" registered in advance are translated into control commands for controlling the operation of the liquid crystal projector 200, and are input to the control unit 90 shown in FIG.

Further, the conference data 44 generated and stored in the storage unit 40 by the generating unit 10 shown in FIG. 1 is reproduced by the reproducer 20 shown in FIG. 1 for each presenter 1000 and each conference participant 1002.

The conference data will be described in detail below.

(Description of meeting data)

FIG. 4 is a schematic diagram showing an example of the data structure of the conference data 44 and the management table 42 of the present embodiment.

The conference data 44 is an electronic file containing a plurality of data fields from the [Conference Data Start] mark to the [Conference Data End] mark.

In addition, the conference data 44 includes fixed presentation data 1420 prepared in advance and variable additional data 1440 that changes as the conference situation changes. The presentation data 1420 is generally managed by the file system of the OS of the PC and held in the storage unit 40 as a secondary storage device.

On the other hand, the additional data 1440 is managed by the control unit 90 that operates by the function of the built-in OS of the liquid crystal projector 200, and is stored in the storage unit 40.

Further, the conference data 44 is identified by a label according to each predetermined unit of the conference.

Here, the predetermined unit may be, for example, a chapter unit, a unit of a chapter, a page unit of a single page displayed, or the like. For example, when units such as chapter units and section units are used, the first few chapters of the chapters can be indicated, so that a particularly effective indication can be made in the demonstration.

As shown in FIG. 4, the presentation data 1420 of the present embodiment is assigned a reference numeral in various units such as the first chapter, the first section, and the first page. Further, a pointer to the address of the image data of the additional data is also provided to the [image] mark or the like of the presentation data 1420, and as a result, the entire chapter data 42 can be specified by specifying the first chapter and the The pages and pages read their data. In the figure, in addition to the arrow of the symbol, the arrow also indicates an example of the position of the pointer and the portion of the indication.

Further, for example, when a unit such as a page unit is used, it corresponds one-to-one with the distribution unit of the print material. In the demonstration using a PC, it is possible to add moving image or sound recording data to a single page portion, but at this time there is always a frame forming a page, which can be interpreted as being included in a part of the data forming the frame. The part that includes the action.

In a well-known technique in the field of PC printing, a language (page description language) that can describe a document genre and print information is used, and one of the widely popular ones is the PostScript language of Adobe. If the description of the conference data 44 is in the PostScript language, it is easy to understand. In other words, a method of describing image information, character information, and the like in units of pages in a program language can be employed.

In this programming language, a description including pixels can be performed based on a set of pixels. In the description language of the conference data 44, this concept is further extended by the fact that the portion of the reproduced sound and the portion of the reproduced moving image can be included by the program description. As a well-known example of processing a general-purpose programming language using an interpreter, there is a BASIC language. Although the BASIC language differs from the PostScript language in that it does not include a concept of describing an image in units of pages, it is suitable for sound data. Regeneration, reproduction of moving images, etc.

In the present embodiment, the JAVA language is merely cited as an interpreter language having a few features on both sides. In the case of the JAVA language, for example, an abstract drawing with AWT (Abstracted Window Tools) and Swinng is not limited by the processing system. JAVA is a trademark of Sun Microsystems, Inc. of the United States.

The application software uses the classification function to implement the functions for performing the required processing.

For example, when it is desired to use the line generation function in the drawing category, a command word for executing the line generation function is requested to generate a message addressed to the above category. When the program containing the command word is executed, for example, if the JAVA virtual machine is mounted as the virtual machine 500 in the conversion unit 50 shown in Fig. 1, straight line pixels can be drawn on any processing system. Similarly, if an image generating program that performs drawing multiple times per unit time is provided, the moving image can be reproduced.

In addition, in the sound data, the processing of the sound collection data is also described in the JAVA language.

These programs are developed and stored at source code levels, which are known as so-called high-level languages, which are described by character codes. The description of the conference data 44 is not limited to the JAVA language. For example, various high-level languages such as the PASCAL-based language in the applicant's Japanese Patent Laid-Open No. Hei 6-4498 can also be used.

Further, as disclosed in Fig. 1 of Japanese Patent Laid-Open No. Hei 6-4498, the program described in the above high-level language is converted by the compiler into an intermediate language object which can be interpreted and executed by the intermediate language interpreter. In the present embodiment, the intermediate language object generated by the above program is used as the conference data 44.

In Fig. 4, the [page start] mark to the [page end] mark are units related to one single page. In this one processing unit, an [image] mark and a [sound] mark are stored. [Image] is marked as a series of labels of variable length fields. In the variable length field, as described above, the drawing command is stored in the intermediate language description generated based on the result of the compilation in the high-level language description. In addition, still image data represented as a set of pixels is also stored in the variable length field by combining with the pixel transfer drawing command.

For the [sound] tag, the data is also stored in the variable length field.

In addition, the demo data 1420 and the additional data 1440 of FIG. 4 can be rewritten in the same manner as an electronic file on a general computer.

The rewritten portion of the additional data 1440 is stored in the variable length data portion enclosed by the [Additional Data Start] flag to the [Additional Data End] flag. In the variable length data portion, image data added by a tablet or the like and sound data added by a microphone or the like are stored.

The image data is stored between the [image data start] mark and the [image data end] mark, and the sound data is stored between the [sound data start] mark and the [sound data end] mark.

Further, in the present embodiment, the data after appending the original presentation data (presentation data 1420) to the various additional data 1440 attached during the conference is referred to as conference data 44 to be distinguished from the original presentation data. Both types of data are electronic files that can be processed by a computer.

Specifically, the sound data input to the sound digitizing device 72 is amplified by the transmission amplifying unit incorporated in the sound digitizing device 72 to an identifiable level, and then collected by the sampling processing unit installed in the sound digitizing device 72 as Digital signal. This data is stored in the storage unit 40 by the control unit 90 as additional data 1440 which is a part of the conference data 44 based on the application software.

In the storage unit 40, in addition to the presentation data 1420 and the additional data 1440 transmitted, the management table 42 for data management used by the control unit 90 is stored.

The management table 42 is a table for identifying and managing devices such as the input device 400, and includes an ID for identifying the device, a device name, and data for identifying a user of the device.

For example, the result of the presenter 1000 operating with the indicator stick 1010 is stored in the storage unit 40 as part of the additional data 1440. Since such image data is stored in a combination with the device ID, for example, when the action of the presenter 1000 is reproduced, the image data stored in the additional data 1440 can be reproduced by being searched from the management table 42.

Further, by adding the time data as the additional data 1440 to the image data, the conference data 44 can be reproduced by specifying the time.

Thus, according to the present embodiment, the conference situation can be immediately reproduced according to the designation of the chapters, and the conference situation can be selectively reproduced according to the individual designation or the time designation of the presenter 1000 or the conference participant 1002.

Hereinafter, the task of the input device 400 will be described. The tablet 410, which is one of the input devices 400, structurally includes a digitizing unit, a coordinate detecting processing unit, an I/O controller, and an IEEE 1394 bus level driver.

The I/O controller of tablet 410 has the target side node capability of the SBP-2 protocol. On the other hand, the I/O controller of the liquid crystal projector 200 controls the SBP-2 driver having the capability of the startup side node of the SBP-2 protocol.

The storage unit 40, which is the local memory of the liquid crystal projector 200, is opened to the IEEE1394 bus 300 as a shared memory by the SBP-2 driver.

The bus-level transaction specified by IEEE 1394-1995 is performed between the IEEE 1394 bus-level driver on the side of the tablet 410 and the IEEE 1394 bus-level driver on the side of the liquid crystal projector. Through this transaction processing, the tablet 410 logs in the SBP-2 driver through the IEEE bus level driver and obtains access permission to the above shared memory space.

In the case where the registration is permitted, the storage unit 40 as the shared storage space on the liquid crystal projector side can be accessed by the tablet 111 before the tablet 410 is deregistered by the IEEE 1394 bus driver.

After the positional detection of the instruction operation by the conference participant 1002 on the image input board 410 by the digitizing means, the coordinate detection processing unit performs relative position conversion, and converts it into the indication coordinates and a series of trajectory data. The indication coordinate data and the trajectory data are stored in the shared storage space provided by the liquid crystal projector 200 by the operation of the SBP-2 protocol described above.

The shared memory space, when viewed from the liquid crystal projector 200, is the local storage space. Therefore, the liquid crystal projector 200 can allocate or copy the shared space to the storage space managed by the process or thread of the virtual machine 500 through the core program of the built-in OS as needed. As can be seen from another point of view, the trajectory of the user's indication action on the tablet 410 can be monitored (monitored) by the process or thread of the virtual machine 500 of the liquid crystal projector 200 at any time.

Hereinafter, the conference data generation processing in the actual conference system will be described.

(Note on the handler in the conference system)

Fig. 5 is a flow chart showing the flow of processing in the conference system according to an example of the embodiment.

When the meeting starts, the meeting data generation process is started, and the meeting data generation process is performed until the end of the meeting.

First, after the start of the conference, if the conference has not ended (step 2), the conference unit 44 stores the conference data 44 in the storage unit 40 (step 4).

When the presentation data generated by the PC or the like is stored in the storage unit 40 (step 6), the reproduction unit 20 reproduces the presentation data 1420 read from the storage unit 40 by the control unit 90 (step 8).

That is, the presentation data is projected by the liquid crystal projector 200, and when there is sound, the sound is also reproduced.

When there is no demo data (step 6), no external operations are performed, but internal processing continues.

When there is external input data (step 10), the control unit 90 stores the input data for each input source and stores it in the storage unit 40 (step 12).

Specifically, for example, when the transfer data including the drawing instruction information and the like transmitted from the tablet 410 is transferred, not only the transfer data but also the identification information of the tablet 410 and the like are stored, thereby using the management table. 42 is stored while managing each input source.

Further, a part of the transmission data or the like is stored as the additional data 1440. The additional data 1440 includes not only the data input from the tablet 410 but also the image data included in the imaging range 1060 of the imaging unit 60 shown in FIG. 2 . That is, the presenter 1000 stores the position data of the image indicated by the pointing stick 1010 or the finger as the additional data 1440.

The conference data 44 is generated in the above manner.

When there is no external input data (step 10), no external operations are performed, but the internal processing is continued.

When the conference participant 1002 issues a reproduction instruction by operating a remote control or the like reproduction instruction device (step 14), the control unit 90 reads the conference data 44 for each predetermined unit in accordance with the designation of the reproduction instruction (steps 16 to 20).).

For example, if the reproduction indication is a designation for each input source (step 16), the conference data 44 is reproduced for each input source (step 18).

Further, if the reproduction instruction is not specified for each input source (step 16), the conference data of the designated portion is reproduced (step 20). Specifically, for example, the control unit 90 determines that the first few chapters corresponding to the presentation data 1420 are designated, and reads the conference data 44 corresponding to the portion from the storage unit 40. Therefore, if the reproduction unit 20 reproduces the portion, the data of the designated portion can be reproduced.

Of course, not only is each input source or a specified part of the alternative, but the two kinds of designations can also be combined to select both at the same time.

The conference data generation processing and the reproduction processing are performed as described above. The above is the case where the tablet 410 is used as the input device 400, and the case where the PC 420 is used as the input device 400 will be described below.

(Example of a conference system when a PC is used as an input device)

Fig. 6 is a functional block diagram of a conference system according to another example of the embodiment.

The liquid crystal projector 202 is connected to the external storage device 240 via the IEEE1394 bus 300, and the liquid crystal projector 202 and the PC 420 are connected via the optical fiber network 310.

This type of conference system is used when connecting meetings between regions that are far apart. Here, it is assumed that a drawing command is issued from the PC 420 provided in the United States to the liquid crystal projector 202 provided in Japan.

In other words, in the illustrated example, the presentation was performed by the liquid crystal projector 200 in the meeting place in Japan, and the conference participant 1002 in the US performed the presentation image generated by the Japanese liquid crystal projector 200 while displaying the presentation screen by the PC 420. Write.

Here, the PC 420 includes a Web browser with a display presentation screen, OS (Operating System), TCP/IP (Transmissive Control Protocol/Internet Protocol), PPP (Point to Point Protocol), and a point-to-point protocol. The software control unit 422 and the transmission/reception unit 424 having an ATM switch.

Further, the liquid crystal projector 202 includes a CGI (Common Gateway Interface), a httpd (Hyper Text Transfer Protocol Daemon), a drawing API (Application Programming Interface), and the like. The software generation unit 12, the conversion unit 52 having the virtual machine 502, the control unit 92 having distributed OS core programs, software such as TCP/IP, PPP, and device driver, the transmission/reception unit (including the ATM switch), and the IEEE 1394 bus. The interface unit 32 for communication of the level driver.

Further, the external storage device 240 includes a control unit 290 and a communication interface unit 292 having an IEEE1394 bus level driver or the like.

Hereinafter, the conference data generation processing in the conference system will be described.

First, in the United States, in the state where the presentation image is displayed on the screen of the PC 420, the conference participant 1002 operating the PC 420 performs an operation for writing the presentation image on the web browser of the screen.

The operation command is converted by the control unit 422 into a form based on a protocol such as TCP/IP, and the transfer data including the operation command is converted into a form that can be converted by the compiler into a data form in which the conference data can be generated, and transmitted. The receiving unit 424 transmits the liquid crystal projector 310 to the liquid crystal projector 202.

In the liquid crystal projector 202, the transmission data transmitted by the communication interface unit 32 is received, and the control unit 92 performs transmission control and the like. The transmitted transmission data is converted into a form in which conference data can be generated by the virtual machine 500, and the generation unit 12 generates conference data.

The transmission data transmitted from the PC 420 and the generated conference data are transmitted from the communication interface unit 32 to the external storage device 240 via the IEEE1394 bus 300, and are controlled by the control unit 290 for each processing device and each of the external storage devices 240. The predetermined units are stored while managing the transmission data and the conference data received by the transmission/reception unit 292.

Further, the generated conference data is displayed by the liquid crystal projector 202 at the venue in Japan, and is transmitted from the communication interface unit 32 to the PC 420. In the PC 420, the received conference data is displayed again on the screen.

Although the above-described transmission/reception processing and data transmission are large data such as transmission of conference data, the IEEE 1394 bus 302 and the optical fiber network 310 are used, so that the transmission can be performed at an extremely high speed.

According to the above-described manner, the conference participant 1002 in the United States can operate the liquid crystal projector 202 from a far distance from the same feeling as the operation of the liquid crystal projector 202 in the Japanese venue.

Further, the transmission data and the conference data are stored in the external storage device 240, and the PC 420 and the external storage device 240 are also connected by the high-speed transmission line. Therefore, it is possible to immediately reproduce the required portion in response to the operation from the PC 420.

Therefore, it is possible to realize a conference system that can quickly replay conference data even when a conference is held between regions that are far apart.

Further, by separately setting the external storage device 240 storing the conference log (history record) and the projector 202, even if the hard disk constituting the external storage device 240 is a RAID (Redundant Array of Inexpensive Disks) structure, When the reliability of data is improved and a large-capacity storage capacity is secured, the versatile liquid crystal projector 202 can be realized without changing the size of the liquid crystal projector 202 itself.

Even when the storage device for storing the conference data and the liquid crystal projector 202 are separately provided as described above, since the communication between the liquid crystal projector 202 and the external storage device 240 can be performed at an extremely high speed, there is almost no existence. Performance issues.

The above is an example in which the PC 420 is used as the input device 400. Hereinafter, a case where the service device is used as the data transfer device to transfer the transmission data will be described.

(Example of a conference system when a service device is used as a data transmission device)

Fig. 7 is a functional block diagram of a conference system according to another example of the embodiment.

The conference system in this embodiment structurally includes a liquid crystal projector 200 and a service device 100 for reproducing conference data.

The liquid crystal projector 200 is the same as the liquid crystal projector 200 described above.

The service device 100 includes a storage unit 102 that stores display data, control data, component objects, and the like, a transmission/reception unit 104, and a control unit 106 that controls data transmission between the storage unit 102 and the transmission/reception unit 104.

Here, the display data may be, for example, image data, presentation data, conference data, etc., and the control data may specifically be, for example, a device driver, data for specifying a drawing range such as coordinates, or the like. Drawing data such as lines or circles, etc.

In particular, in view of the fact that image data is generated in two forms, it is necessary to design a processing system. The first form is that the entire image is generated as a set of pixels. When a photo of a natural image is acquired by an image scanning device, each pixel is defined as color data accompanied by a different gray level, and the image as a whole is defined as a set of the pixels.

The second form is to generate pixels from any of the command words. In a processing system that uses a combination of a straight line, a Bezier curve, an arc, and the like to represent a figure, a line generation command (usually specifying a drawing start coordinate, a terminating end coordinate, and a line width) is performed according to the resolution of the processing system as an object The degree or coordinate system produces a list of points and forms pixels to draw a portion of the graph.

In most cases, an image display system of a computer device uses a set of pixels of the former to represent graphics while using the latter command words to represent graphics. In addition, the way in which the outline glyphs are used to generate text, since the original text shape is made up of straight lines? The curve drawing command is described, so it is an example of the latter. As will be described later, the generation of pixels based on the command word is an application example in which a plurality of liquid crystal projectors are used to draw over a wide area, and is a preferable example in which dispersion processing is required.

When a pixel is generated according to any drawing command, it is necessary to have a program for performing the operation, and the program must be in a form that can be executed on hardware including the processor as an object. In the present embodiment, the execution unit of such a program is referred to as a "component object".

A component object that is used as part of the software for image generation or reproduction. Specifically, for example, it may be a JAVA applet or JAVA Beans.

For example, it is assumed that the service device 100 is a web server, and is a form in which various data for conference data generation is stored in the storage unit 102.

The liquid crystal projector 200 can download a device driver, a JAVA applet, or the like from the service device 100.

In this way, the function of the liquid crystal projector 200 can be easily expanded. That is, when it is necessary to hold a new form of meeting, the organizer of the meeting stores necessary information in the service device 100, and the meeting participant 1002 can load necessary information from the service device 100 into the liquid crystal projector 200, thereby enabling Quickly adapt to new forms of meetings.

Specifically, for example, when the liquid crystal projector 200 currently has a function of drawing a line on a part of the screen, a component object having a function of enclosing a part of the screen with a circle is received and loaded into the conference data generating program. You can add a function to surround a part of the screen with a circle.

Further, since the function can be expanded by software instead of hardware, the liquid crystal drive circuit and the like can be simplified. That is, in general, in a liquid crystal projector, image data is converted into a digital signal by an AD converter, and image information is stored in a first frame memory. Then, the image information is convoluted by the digital filter circuit and stored in the second frame memory. Next, the image data in the second frame memory is read out at a certain period so as to be displayed on the liquid crystal light valve by the liquid crystal controller.

Further, here, the convolution operation refers to an image filtering technique for changing the tap coefficients in accordance with the sharpness of the image, thereby changing the image quality.

In these drive circuits, image deterioration due to phase difference is caused by the difference in input image data, and in order to reduce the phase difference, a high-performance PLL circuit must be employed. Further, in the case where a plurality of liquid crystal projectors having different resolutions are connected to each other, it is necessary to provide a scaling circuit for image processing for image interpolation. However, such image processing will deteriorate the image.

On the other hand, if the application software for operating the respective units of the liquid crystal projector 200 equipped with the virtual machine 500 is used as the embodiment, and the image data input to the liquid crystal projector 200 is converted based on the number of pixels of the liquid crystal, Image deterioration due to image processing by the scaling circuit does not occur, and since it is not necessary to provide a plurality of frame memories, the circuit configuration can be simplified.

As such an application software, for example, the display image of the input image data is developed by the virtual machine 500 in a VRAM (Video RAM) and the display image in the VRAM is displayed on the liquid crystal panel through the liquid crystal controller. Processing software.

Although the liquid crystal projector 200 and the input device 400 have been mainly described above, the same operational effects can be obtained for the liquid crystal projector 200 and the output device 600.

That is, for example, the conference data is generated by the liquid crystal projector 200, and the generated conference data is transmitted from the communication interface unit 30 to the output device 600.

Here, when the printer 600 is used as the output device 600, the conference participant 1002 can print the conference data in accordance with the output instruction.

Further, when the display device 600 is used as the output device 600, for example, the conference participant 1002 can display the conference data based on the output instruction.

The output instruction in this case may be performed for each input device 400 and each predetermined unit, and the conference participant 1002 may immediately obtain the conference data requested by himself according to the instruction.

As described above, although the conference system can be constructed mainly with the liquid crystal projector 200, a new form of conference system can be realized by using a control device.

(Example of a conference system using a control device)

FIG. 8 is a simplified diagram of a conference system employing a control device 900.

One control device 900 and a plurality of processing devices that perform conference data processing are connected via a network including an IEEE1394 bus 300 as a transmission line, and transmission and reception of transmission data are performed between the respective processing devices to generate conference data.

The control device 900 includes a storage unit 910, a management unit 920 that manages data in the storage unit 40 while managing the connection state of each processing device and the network, and a transmission for controlling transmission of data in the control device 900. Control unit 930.

Further, as the processing device, for example, various devices such as the portable information terminal 402, the scanner 404, the liquid crystal projector 200, the PC 400, and the printer 602 can be used.

In this form, the processing of the conference data is performed as follows.

FIG. 9 is a flow chart showing the flow of processing in the conference system using the control device 900.

Initially, the control device 900 is activated and connected to the IEEE1394 bus 300, and other devices are also connected to the IEEE1394 bus 300. (Step 32).

When a certain processing device is connected, the transmission data including the packet indicating the state after the connection and the service provided by the processing device is transmitted to the control device 900. Here, the term "service" refers to the function provided by each processing device.

When the control device 900 receives the transfer data including the packet, the management unit 920 confirms that the registered service has been completed in the management table stored in the storage unit 910 (step 34), and if the same service is registered, Then, the priority and the like are adjusted (step 36).

The management unit 920 registers the provided service in the management table after confirming the provision of the service (step 38).

FIG. 10 is a diagram showing an example of the management table 912.

In the management table 912, an ID for identifying each processing device, a service provided by the processing device, and a state of the processing device are mainly stored. This identification ID assigns an ID value that is not repeated even when a plurality of processing devices are connected to the network.

When receiving the transmission data including the packet indicating the service request (step 40), the control unit 900 searches the management table 912 to search for a processing device that can provide a service that can respond to the service request.

For example, when a request for printing a part of the conference data is issued from the portable information terminal 402, the control device 900 searches the management table 912 with the management unit 920 to search for a processing device that can provide a print service, when searching for the service is provided. When the printer 602 confirms its status and is in a state in which processing is possible, the transfer control unit 930 establishes a connection between the portable information terminal 402 requesting the service and the printer 602 that responds to the service.

Once the connection is established, transmission data such as conference data can be transmitted and received between the processing device that issued the request and the processing device that responds to the request without having to pass through the control device 900.

In this case, for example, after the connection is established, a part of the conference data is transmitted from the portable information terminal 402 to the printer 602, and the print service is provided by the printer 602 (step 42).

Thus, by adopting the control device 900, it is possible to realize a conference system capable of unitarily managing the service and flexibly changing the processing device in accordance with the situation of the applied conference.

Even in such a conference system, it is preferable to install the virtual machine 500 in the control device 900 and each processing device. The reason for this is that by using the virtual machine 500, the model of the destination end or the OS or the like can be completely ignored when transmitting the transmission data, so that the degree of freedom of the device structure can be increased, and more diverse conferences can be performed.

As a technique for connecting the above-described control device 900 to a plurality of processing devices, for example, Jini of Sun Microsystems, Inc., in the present embodiment, the conference data 44 shown in FIG. 4 can be stored in the storage unit 910 of the control device 900 and It is completely different from Jini in that it can be updated and managed.

In the example described above, an example in which one processing device provides one service has been described. However, a case where a plurality of conference data reproducing apparatuses provide one service, that is, while distributing the conference data while performing distributed processing, will be described. .

(Description on Dispersion Processing)

Most of the current application software developed under the OS of a commercial PC is compiled and translated into a mechanical language that can be directly interpreted by a microprocessor. In this method, it is generally necessary to consider the architecture of the microprocessor using the application software and the inter-program interface with the service routines of the OS from the development stage of the application software (generally called API: Application). Programming Interface; and programming.

However, in the conference system of the present embodiment, the conference data 44 or the original presentation data is translated and executed centering on the liquid crystal projector 200 or the PC or WS serving as the processing device 700.

The liquid crystal projector 200 can not be limited to a certain microprocessor at the time of design, even when it is actually commercialized, even if it is provided to the user at an appropriate price, and the processing device 700 can be said to be the same. of. Further, as the processing device 700, not only a PC or a WS but also a portable information terminal is used in order to be used in a place to go out.

In the case of a mixed environment of different microprocessors and APIs with different APIs as described above, in order to abstract the differences of environments and provide an environment that can be used together, a virtual machine interpreter (such as a virtual machine) should be used. 500).

The problem that can be solved by using the virtual machine's interpreter is to eliminate the differences in different computer architectures (the abstraction of the execution environment).

On the other hand, the transmission data transmitted and received in the conference system is large data such as moving images, and a large amount of data is also transmitted and received when the conference is to be performed for several hours.

In order to efficiently process such large and large amounts of data, not only an interpreter of a virtual machine is required, but also a structure of a high-speed transmission line and a dynamic dispersion processing capable of dynamically distributing processing load in each apparatus is required.

Fig. 11 is a view showing image display when image display is performed in a distributed manner, wherein (A) is a view showing an image display example when only one liquid crystal projector is used, and (B) is a view showing four liquid crystal projections. The image of the machine is shown in the figure.

When image display is performed by one liquid crystal projector 200, UXGA display, that is, 1600×1200 dots display can be performed by the PC that transmits the conference data to the liquid crystal projector 200, but the liquid crystal projector 200 can only correspond to In the state where the XGA display, that is, the display of 1024×768 dots is reached, according to the presenter's instruction, sometimes the indicator may indicate coordinates that can be displayed on the PC but not displayed on the liquid crystal projector 200 (1500, 920).)

In this case, as shown in FIG. 11(A), it is actually not displayed on the liquid crystal projector 200. Therefore, since the presenter cannot make the pointer operate according to his own operation, there is a case where an effective presentation cannot be performed.

In order to avoid this, as shown in FIG. 11(B), four liquid crystal projectors 200 can be used to project four images 1210-1 to 4 in a shared manner so as to be able to support the display corresponding to the display on the PC. Display area.

Fig. 12 is a view showing a state in which four liquid crystal projectors 200-1 to 4 are used and image display is performed in a distributed manner.

When displaying one image in a shared manner, it is necessary to decide which device to share which region. The use of four liquid crystal projectors to spatially divide an image for display is a typical parallel processing method. At the stage of generating the original presentation file by the application software of the processing device 700, it is convenient in processing if the parallel syntax applicable to such parallel processing is described. In JP-A-6-4498, a method of writing and translating parallel execution units included in a cobegin coend is disclosed, and this method can also be used in this embodiment.

FIG. 13 is a schematic diagram showing a communication method when the virtual machine 500 is used. (A) is a view showing a conventional communication method, and (B) is a view showing a communication method according to the present embodiment.

In order to perform the above-described dynamic dispersion processing, it is necessary to install not only the virtual machine 500 in the projector 200 but also the generation of the application software, that is, the application layer program 12, which must be generated after considering which drawing area is shared by which liquid crystal projector 200. .

In general, in order to perform parallel processing on a certain execution unit of a program, the following two conditions must be met. First, the first condition is that the object program processing system including the OS must have resources that can execute a certain program slice, that is, an execution unit in parallel, and more specifically, must have an independent correspondence with the number of parallel processing. Processing device. The second condition is that the object program itself must be described as having a processing unit that can be executed in parallel and can be judged in the processing system.

Further, in the present embodiment, "decentralized execution" is a broad concept of parallel execution. When a certain processing unit is distributed to another processing system, it is desirable to process in parallel in time and at the time of obtaining the result. A special case that must be synchronized is called "parallel execution."

For example, as shown in FIG. 13(A), when two liquid crystal projectors 200-5 and 6 are connected via the IEEE802.3 bus 192, they should be established between the application layer programs 12-5 and 6. Like the connection on the other side. When the first liquid crystal projector 200-5 that starts interpreting the original presentation data detects that it exceeds its own display range in the statement of the program, it tries to distribute the portion with the liquid crystal projector 200-6. .

At this time, as a specific operation, the control unit of the transmission control program of the built-in OS of the liquid crystal projector 200 is read, and the line connected to the liquid crystal projector 200-6 is opened by the IEEE802.3 bus 192, and the target range of the distributed processing is transmitted. .

The application layer program 12-5 must sequentially perform processing such as network connection, line opening, and processing part of the transmission using the service routine of the built-in OS. The other application layer program 12-6 is required to perform the same network connection, allow line opening, and receive part processing, etc., on the service side.

In order to use a plurality of liquid crystal projectors, it is only required to perform the above-described processes to make the specifications of the application layer programs 12-5 and 6 described as the original presentation files complicated, and it is necessary to rewrite them in accordance with the execution environment each time.

As mentioned above, the application layer program 12 seen here is actually the original presentation data generated by another application layer program for generating presentation material. As shown in the example of FIG. 4, the content of the original presentation data can be interpreted as a set of command words of intermediate language objects executed by virtual machine 500.

For ease of use, it must be designed to cross-describe a variety of parallel syntaxes from the beginning in the application layer program with a certain degree of parallel processing, and can be executed in parallel when the execution environment allows parallel processing. As an alternative, the virtual machine 500 can also communicate with other virtual machines in a dynamic and independent manner during the execution phase and disperse the processing.

As a method of pre-described a plurality of parallel processing syntaxes as the former, a communication method between the intermediate language interpreting programs disclosed by the applicant in Japanese Patent Laid-Open No. Hei 6-4498 can be installed.

In addition, as a way of communicating with other virtual machines in a dynamic and independent manner in the execution phase, for example, a method implemented using a JAVA virtual machine, a multi-node based method, or the like may be employed.

By adopting the above method, even when the number of liquid crystal projectors is increased to 16, 64, etc., it is not necessary to rewrite the original presentation data again.

In the present embodiment, as shown in Fig. 13(B), an IEEE 1394 bus 300 that realizes long-distance access of storage resources between nodes is employed.

In the case where the communication method between the intermediate language interpreting programs disclosed by the applicant in Japanese Patent Laid-Open No. Hei 6-4498 is installed, the main interpreter of the virtual machine 500-1 of a certain liquid crystal projector 200-1 is in the loading phase. Reading the object code

described in the working area of the slave side interpreter as the executed process in the intermediate language into the storage space of the other liquid crystal projector 200-2, and then reading the stack initialization data, and according to the The indication of the data stores the data of the initial state on the stack and sets the stack pointer.

Next, the table initialization data is read, and a series of operations for initial setting the contents of the execution block data management table and the shared resource management table are performed. The above operation can be realized by a higher layer protocol such as communication using an RS232C serial line or the like, or a network file system commonly found in an OS of a UNIX system. However, in order to perform remote memory access at a realistic processing speed, it is necessary to perform installation by IEEE 1394 bus transaction processing.

In this manner, when the application layer programs 12-1, 2 are generated, they can be generated without considering the drawing sharing area or the like, and can be between the virtual machines 500 lower than the application layer programs 12-1, 2 by one level. A virtual connection is established on the image.

Hereinafter, the distributed processing of this embodiment when the JAVA virtual machine is used as the virtual machine 500 will be described in detail.

Fig. 14 is a functional block diagram at the time of performing the dispersion processing of the embodiment.

The liquid crystal projector 200-1 includes a conversion unit 50 to which a virtual machine 500 for converting transmission data transmitted from another liquid crystal projector 200-2 or the like as a data transfer device into a data format that can be generated or reproduced is mounted, and The communication interface unit 30 that receives the transmission data that can be converted by the conversion unit 50 from the input device 400.

Further, the liquid crystal projector 200 further includes a generating unit 10 that generates meeting data based on the transfer data converted by the converting unit 50, and performs the generated meeting data for each of the other liquid crystal projectors 200 for each predetermined unit. The management unit 90 that stores the conference data in the storage unit 40 and reads the conference data for each of the other liquid crystal projectors 200 and the reproduction unit 20 that reproduces the read conference data is managed.

In the storage unit 40, in addition to the conference data including the presentation data and the transmitted transmission data, the management table 42 and the like used by the control unit 90 are stored.

Further, the storage unit 40 can be accessed by the communication interface unit 30 by another liquid crystal projector 200 or the like.

Hereinafter, the virtual machine 500 used in the present embodiment will be described.

FIG. 15 is a functional block diagram of a software unit and a hardware unit in the projector 200.

The software unit includes a generation unit 10 having an API for audio processing (Application Programming Interface) and an image processing API, a scheduler having a plurality of command words, a command word, and a plurality of device drivers. The control unit 90 of the runtime library and the virtual machine 500.

Alternatively, a sound processing stage or an image processing stage may be installed instead of the sound processing API or the image processing API.

The virtual machine 500 used in the present embodiment means a device that reads a common file format and thus can perform the specified operation, and specifically, for example, a JAVA virtual machine or the device disclosed in Japanese Laid-Open Patent Publication No. Hei 6-4498. There are virtual machines such as interpreters that can be processed in parallel.

As the installation method of the JAVA virtual machine, an interpreter method, a compiling method, a dedicated CPU method installed in the hardware unit, and the like installed in the software unit may be employed, but in the present embodiment, it is installed in the software unit.

The virtual machine 500 structurally includes a plurality of threads each having one program counter and one stack, and a heap area. That is, the stack and the heap area are work areas, and also function as the storage unit 40.

In addition, since there are a plurality of stacks, so-called multi-thread processing can be performed. Therefore, the execution performance and the parallel execution performance at the time of the distributed processing can be improved.

Further, the hardware unit includes a reproduction unit 20 equipped with a display unit, a control unit 90 having a video controller, a storage unit 40 having a video RAM (V-RAM) area, and an IEEE1394 link layer and IEEE1394 physics. The layer communication interface unit 30.

Hereinafter, actual display processing using a plurality of liquid crystal projectors 200-1 and 2 will be described.

It is assumed that the liquid crystal projector 200-1 is used as a main projector, and the liquid crystal projector 200-2 is used as a slave projector.

It is assumed that the liquid crystal projector 200-1 draws an image 1210-1, that is, coordinates (0, 0) to coordinates (1024, 768). This drawing information is stored in the storage unit 40.

When the second liquid crystal projector 200-2 is connected to the IEEE1394 bus 300, the liquid crystal projector 200-1 serving as a main projector and the liquid crystal projector 200-2 serving as a slave projector can transmit and receive transmission data.

At this stage, the liquid crystal projector 200-2 can judge that the liquid crystal projector 200-1 has been operated while referring to the drawing information of the storage unit 40-1 of the liquid crystal projector 200-1, thereby confirming that the liquid crystal projector 200-1 shares Drawing area.

After the confirmation, the liquid crystal projector 200-2 reads out the image information to be displayed by itself from the storage unit 40-1 of the liquid crystal projector 200-1, and converts it into a data format that can be processed by the own device by the virtual machine 500. Write to the V-RAM area and display it on the display under the control of the video controller.

As described above, the stack area in the storage section 40 is provided for each thread. Even if the stack area within a certain thread is in use due to multi-thread processing, the stack area of other threads can be used, so even in the case of the shared storage unit 40, the parallel execution is hardly lowered.

Further, since the transmission data can be transmitted and received at a high speed by using the IEEE1394 bus 300 and the IEEE1394 bus interface, even in the case of sharing the storage unit 40, each of the liquid crystal projectors 200 can be almost identical to the storage unit 40 that references itself. The same speed is referred to the storage unit 40 of the other liquid crystal projector 200.

Further, for example, there may be cases where the liquid crystal projectors 200 having different display capabilities are mixed, that is, one liquid crystal projector 200 is a VGA display, that is, 640×480 dots display, and the other liquid crystal projector 200 is an SVGR display. That is, 800 x 600 dots are displayed, and the other liquid crystal projector 200 is an XGR display, that is, a 1024 x 768 dot display.

In the above case, even when it is necessary to display the above-described coordinates (1500, 920), display can be performed by connecting liquid crystal projectors 200 having different display capabilities to each other. For example, if the main liquid crystal projector 200 is a VGR display, if all nine liquid crystal projectors 200 are connected, the display area of 1920 × 1440 dots can be covered, and thus the coordinates (1500, 920) can be displayed.

Even in this case, the slave liquid crystal projector 200 can automatically adjust the display capability by referring to the drawing information in the storage unit 40 of the main liquid crystal projector 200. In this way, since the conference data can be generated by the effective distributed processing, even a large and large amount of conference data can be smoothly generated and reproduced, so that a conference system with fast response can be realized. Further, not only the distributed processing implementation based on the shared memory method but also the above-described distributed processing may be performed in the target transfer manner.

Although the method for realizing the conference system has been described above, the conference system that achieves the above-described effects can also be realized by the computer-readable information storage medium.

(Note on information storage media)

Fig. 16 is a functional block diagram of an information storage medium according to an example of the embodiment. The information storage medium 1400 stores information for realizing the above various functions in the storage information for reading by the computer 1200. The computer 1200 includes a transmission/reception unit 1230 for communicating with another processing device 1100 via the communication line 1300, a storage unit 1240 that stores various data and programs, and the like, and a processing unit 1250 that performs image processing and the like. The reproduction unit 1220 that reproduces data such as the display, and the information reading unit 1290 that reads information from the information storage medium 1400.

As the hardware configuration of each of the above-described units, for example, as the transmission/reception unit 1230, a communication device having an IEEE1394 interface, an ATM switch, or the like can be used as the storage unit 1240. A ROM, a RAM, or the like can be used. As the reproduction unit 1220, a display, a projection device, or the like can be used. As the processing unit 1250, a CPU, an image processing processor, or the like can be used.

Further, as the information storage medium 1400, for example, a hard disk or a memory such as a CD ROM or a DVD ROM that reads information by a laser, and magnetic information can be used.

Further, instead of directly connecting the information storage medium 1400 to the information reading unit 1290, the computer 1200 may download and read the storage information 1410 in the service device via the communication line 1300.

Further, as the communication line 1300 which is a transmission line, for example, an IEEE 1394 bus, an optical fiber, or the like can be used.

Here, for example, when the log function described above is implemented, the storage information 1410 is information that receives transmission data from the plurality of processing devices 1100 via the transmission line, that is, the communication line 1300, and generates conference data reflecting the transmission data, the information including the structure. The presentation information, the storage information for storing the transmission data in each of the processing devices 1100, and the storage information stored in the storage unit 1240 and the reproduction instruction for the conference participant are read from the storage unit 1240. Information for reading the conference data of at least a part of the data and the presentation information.

In this way, the conference participants can immediately replay the past conference data according to the instructions.

Further, it is preferable that the read information includes information for reading the conference data stored in the storage unit 1240 for each processing device 1100 in accordance with the reproduction instruction.

In this way, it is possible to discriminate from which processing device 1100 what kind of transmission data is received.

In addition, the conference data reflecting the transmission data of each processing device 1100 may be reproduced. Specifically, for example, when a plurality of conference participants transmit input data using their respective input devices, playback can be performed for each input device, that is, for each conference participant.

Preferably, the storage information 1410 includes information for capturing a situation of the conference, and the storage information includes information for storing the image data as a part of the conference data in the storage unit 1240 in a predetermined unit, the reading. The usage information includes information for reading the conference data stored in the storage unit 1240 in each predetermined unit in accordance with the above-described reproduction instruction.

In this way, the camera results of the conference situation can be immediately reproduced. Since the image data includes not only the reproduced presentation data but also the motion of the presenter, the conference situation can be appropriately grasped.

Similarly, it is preferable that the storage information 1410 includes recording information for recording a conference situation, and the storage information stores the recorded data as a part of the conference data in the storage device in a predetermined unit.

In this way, since the sounds can be combined and reproduced, it is possible to further appropriately grasp the situation of the meeting.

Here, as the predetermined unit described above, for example, a chapter unit, a unit of a chapter, a page unit, or the like can be used. That is, for example, if the conference participant issues a reproduction instruction in the second section of Chapter 3, the portion can be played back immediately.

Further, the stored information 1410 preferably further includes information for reproducing the read information.

In this manner, the read conference data is reproduced by display, projection, sound reproduction, etc., so that the conference participants can immediately confirm the conference data. Further, the stored information 1410 preferably further includes information for transmitting the read information described above to the processing device 1100.

In this manner, the reproduction, printing, and the like of the conference data can be performed by the processing device 1100 such as a display device, a printing device, or the like.

Further, in order to improve the above-described mutual connectivity, the storage information 1400 can be configured as follows.

For example, the storage information 1410 is configured to include interpretation information for installing the virtual machine 500 and interpreting the received transmission data by the virtual machine 500, and generation information for generating the conference data based on the interpretation result.

In this manner, data exchange between the processing device 1100 and the computer 1200 can be easily performed by using the virtual machine 500 which generalizes the form of the transmitted data and converts it into the transfer data which can be interpreted by the device itself. Thereby, a conference system capable of flexibly replacing various processing devices can be realized.

Further, as another configuration, the storage information 1410 is configured to include information for generating transmission data that can be interpreted by the virtual machine 500 and information for transmitting the generated transmission data.

In this manner, by generalizing the form of the transmitted data and generating and transmitting the transfer data which can be interpreted by the virtual machine 500 in the other processing device 1100, the processing device receiving the transferred data does not need to consider the transfer device of the transfer data. The type or manufacturer can handle the transfer of data. Therefore, data exchange between the processing apparatuses 1100 can be facilitated. Thereby, a conference system capable of flexibly replacing various processing apparatuses 1100 can be realized.

Further, as another configuration, the storage information 1410 is configured to include presentation information for transmitting a state in which the above-described explanation has been performed on the input data including the processing device transmitted from the plurality of input devices. The data is stored in the storage device while the data is managed by each of the input devices, and the conference data for reproducing at least a part of the input data and the presentation information from the storage device based on the playback instruction. Information for recycling.

In this way, the conference participants can play back according to the conference data indicating the past.

Further, preferably, the storage information includes storage data for storing the transfer data including the input data in the state in which the above-described explanation has been performed, and storing the data in the

storage unit 1240. The information, the reproduction information, includes reproduction information for reproducing, from the storage device, at least a part of the conference data including the transmission data and the presentation information, in accordance with the reproduction instruction.

In this manner, the conference participants can perform playback for each processing device 1100 by issuing an instruction to reproduce past conference data for each processing device.

Specifically, for example, when a plurality of conference participants transmit input data using their respective input devices, playback can be performed for each input device, that is, for each conference participant.

Further, preferably, the storage information 1410 includes information for capturing a situation of the conference, and the storage information includes information for storing the transmission data including the imaging result in the storage unit 1410 in a predetermined unit, and the reproduction is performed. The information includes transmission data for reproducing the image pickup result stored in the storage unit 1410 in accordance with each of the predetermined units in accordance with the reproduction instruction.

In this way, the camera results of the conference situation can be immediately reproduced. Since the image data includes not only the reproduced presentation data but also additional information such as an image indicated by the presenter, the conference situation can be appropriately grasped.

Here, as the predetermined unit described above, for example, a chapter unit, a unit, a page unit, or the like can be used. That is, for example, if the conference participant issues a reproduction instruction in the second section of Chapter 3, the portion can be played back immediately.

Further, the transmission data preferably includes at least one of image data, an image generation object, an image generation control object, an image display object, and an image display control object.

In this way, a conference system capable of efficiently exchanging various data used in a conference can be realized.

Further, the above transmission line preferably includes an IEEE1394 bus in its structure.

In this way, it is possible to exchange transmission data and the like at high speed between the respective processing devices. In particular, although the amount of data transmitted by image data or the like is large, real-time processing can be easily performed by using the IEEE 1394 bus.

The above is the configuration of the storage information 1410 for improving the mutual connectivity. Hereinafter, the configuration of the storage information 1410 for improving the data processing efficiency of the distributed processing will be described.

For example, the storage information 1410 is configured to generate conference data while transmitting and receiving the general-purpose transmission data interpretable by the virtual machine 500 between the plurality of processing devices 1100 connected via the transmission line, that is, the communication line 1300, and performing distributed processing. The information includes information for installing the communication interface unit 30 for sharing the storage unit 1240 with the other processing device 1100.

In this manner, the storage unit 1240 accessible by each processing device 1100 can be provided. Since this storage method is realized, it is particularly effective in the dispersion processing.

Here, the transmission line is preferably an IEEE 1394 bus, and the communication interface unit is preferably an IEEE 1394 bus interface.

In this manner, each processing device 1100 can be made to access the shared storage unit 1240 at a high speed as if it were a storage area of the own device.

Further, as another configuration, the storage information 1410 is configured to transmit and receive the general-purpose transmission data interpretable by the virtual machine 500 between the plurality of processing devices 1100 connected through the transmission line, that is, the communication line 1300, and perform The distributed processing generates information of the conference data, the information including structure information for generating the general-purpose transmission data, and for transmitting to at least one processing device 1100

having a storage unit accessible by each processing device 1100. The generated information of the above transmitted data.

In this manner, by generating the general-purpose transmission data and storing it in the shared storage device, each processing device can access the storage portion and acquire the transmission data, which is particularly effective in the distributed processing.

For example, when the JAVA applet is used as the transfer data, the plurality of processing devices can simultaneously download the JAVA applet stored in the storage device, and the specification change, function expansion, and the like can be easily performed.

Here, the above transmission line is preferably an IEEE 1393 bus.

In this manner, each processing device can be made to access the shared storage area at a high speed as if accessing the storage area of the own device.

Further, as another configuration, it is preferable that the storage information 1410 is configured to transmit and receive a general-purpose transmission data interpretable by the virtual machine 500 between a plurality of processing apparatuses 1100 connected by a transmission line and perform distributed processing. The information of the conference data is reproduced and configured to include the conference stored in the storage unit by at least one of the processing devices 1100 having a storage unit that can access the conference data by the processing device 1100 and store the conference data. Information for reading data and information for reproducing reproduction of the read image data.

Further, the read information includes, in structure, information for generating transfer data indicating a read request and converting the transfer data into the general-purpose transfer data, and for processing the device 1100 having the storage unit. Transmitting the converted transmission data and receiving information of the transmission data including the conference data from the processing device 1100, the reproduction information including the information for installing the virtual machine 500 and the transmission data according to the reception The virtual machine 500 converts information for transmitting data and reproducing the conference data.

In this manner, by using the transfer data in a general form, it is possible to adapt to the difference of the OS or the manufacturer and to receive and display the image data without considering the device category on the image supply side.

Further, as another configuration, it is preferable that the storage information 1410 is configured to transmit and receive a general-purpose transmission data interpretable by the virtual machine 500 between a plurality of processing apparatuses 1100 connected by a transmission line and perform distributed processing. The information of the conference data is generated and includes request information for requesting a predetermined service from the other processing device 1100, and provision information for providing a predetermined service to the other processing device 1100.

The request information includes information for generating transmission data indicating the predetermined service request and converting the transmission data into the general-purpose transmission data, and information for transmitting the converted transmission data to another processing device. The above-mentioned providing information includes information for installing the virtual machine 500, information for receiving transmission data indicating a service request from another processing device, and converting the data by the virtual machine 500, and determining whether the information can be provided based on the converted transmission data. Information about the service and information that is used to provide the service when it is available.

In this manner, each processing device can perform image processing in a shared manner while exchanging information with each other. For example, if a print service is requested by a projector, a printer that can provide a print service prints in response to the request.

This decentralization processing can also be realized by simplifying data exchange between the respective processing apparatuses 1100 by employing the virtual machine 500 and making the transmission data into a general form.

Further, it is preferable that the transmission data includes at least one of conference data, a conference data generation target, a conference data generation control target, a conference data reproduction target, and a conference data reproduction control target.

In this way, since these data or objects have been unified into a general form, the versatility of various image processing in the distributed processing can be improved.

Further, the above transmission line preferably includes an IEEE1304 bus in structure.

In this manner, each processing device 1100 can be made to access the shared storage device at a high speed as if accessing the storage area of the own device. Further, each processing device can perform the above-described information exchange at a high speed, so that the processing speed can be improved.

(Modification)

The application of the present invention is not limited to the above embodiments, and can be applied to various modifications.

For example, an embodiment in which the IEEE1394 bus 300 is employed has been described as the above transmission line, but various forms can be adopted as long as it is a high-speed transmission line. Specifically, for example, a light channel or a satellite communication line or the like can be employed.

Further, in the above embodiment, the dispersion processing using two conference data reproducing apparatuses (liquid crystal projector 200) has been described, but two conference data generating apparatuses, one conference data generating apparatus, and one conference data reproducing apparatus are employed. Dispersion treatment is also included in the scope of application of the present invention.

Further, the data used for the presentation is mainly the addition of secondary information such as the collected sound, the character code obtained as a result of the voice recognition, and the character code obtained by handwritten character recognition on a digitizing device such as a tablet. For these recognition processes, high-speed processing can be realized by using a DSF (Digital Signal Processor) which is superior in the arithmetic function of the information processing system. As is apparent from the above embodiments, the distributed processing of the present invention is dispersed based on communication between virtual machine interfaces and independent processing.

If it is in the existing mode, in order to use the DSP, the application software (application layer program) must be generated by the special machine language inherent to the DSP and transmitted and executed by the DSP system. However, according to the present invention, a virtual machine interpreter can be installed on a DSP system connected through an IEEE 1394 bus, and applied to process dispersion. As a result, the DSP's superior computing power resources can be used without having to rewrite the original presentation file as an application layer program.

Further, as described above, the programming language for implementing the present invention is not limited to JAVA. There are a variety of languages that can generate virtual machines and can support multiplexing of processor resources at the machine language level described above. In this language, the same description as the description of the above-described drawing command in the present invention can be performed. The present invention can be implemented in a variety of languages that do not rely on high level language-level syntax lexical analysis specifications to achieve the degree of drawing command words. Industrial applicability

The present invention can be applied to a conference system in which a presenter applies a presentation to a listener using a personal computer and a projector.

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CN102065267A Method and apparatus for sharing data in video conference system

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Method and apparatus for sharing data in video conference system

Abstract

A method and an apparatus for sharing data in a Video Conference System (VCS) are provided. According to an embodiment, when a user wants to share data with the other party in the VCS, only a user selected region and not the entire screen is converted into a format optimized for the other party's display and then transmitted to the other party.

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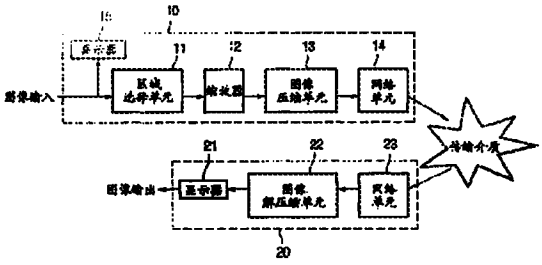
权利要求书 2 页 说明书 8 页 附图 8 页

(54)发明名称

在视频会议系统中共享数据的方法和装置

(57)摘要

本发明涉及在视频会议系统中共享数据的方法和装置。根据实施方式，当用户希望在视频会议系统中与另一方共享数据时，仅将用户选择的区域而不是整个画面转换为针对另一方的显示器最优化的格式，然后将其发送到另一方。



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1. 一种用于与第二终端合作来提供视频会议的第一终端，该第一终端包括：

显示器，其被构成为显示包括第一窗口和第二窗口的多个窗口，所述第一窗口被构成为显示所述第二终端处的至少一个用户的图像，所述第二窗口被构成为显示所述第一终端的与所述视频会议相关联的内容；

用户输入单元，其被构成为接收用户对所述第二窗口上显示的内容的一部分的选择；

区域选择单元，其被构成为提取所述第二窗口上显示的内容的所选择部分；以及

网络单元，其被构成为向所述第二终端发送所述内容的所提取部分。

2. 根据权利要求 1 所述的第一终端，其中，所述第二窗口上显示的内容是图像或文本。

3. 根据权利要求 1 所述的第一终端，其中，当所述第二窗口上显示的内容包括文本时，所述显示器被进一步构成为显示请问是否将所述文本单独发送到所述第二终端的弹出窗口。

4. 根据权利要求 1 所述的第一终端，其中，所述多个窗口进一步包括第三窗口，该第三窗口用于显示所述内容的已发送部分在所述第二终端的显示图像。

5. 根据权利要求 1 所述的第一终端，该第一终端进一步包括：

图像压缩器，其被构成为对所述内容的所提取部分进行压缩；和 / 或

缩放器，其被构成为对所述内容的所提取部分进行缩放。

6. 根据权利要求 1 所述的第一终端，其中，所述显示器在弹出窗口中显示所述内容的所提取部分。

7. 根据权利要求 1 所述的第一终端，其中，所述网络单元从所述第二终端接收在所述第二终端上显示的已发送的所述内容的所提取部分的画面状态信息，并且，所述显示器显示接收到的画面状态信息。

8. 根据权利要求 1 所述的第一终端，其中，根据用户输入而改变在所述显示器上显示所述多个窗口的方式。

9. 根据权利要求 1 所述的第一终端，其中，所述显示器显示所述第二终端的显示器的分辨率信息或尺寸信息。

10. 根据权利要求 1 所述的第一终端，其中，所述显示器进一步在所述第二窗口上显示指示符，该指示符用于改变要选择的内容部分的尺寸。

11. 根据权利要求 1 所述的第一终端，该第一终端进一步包括：

确定单元，其被构成为确定在所述内容的所选择部分中是否包括文本；以及

文本提取单元，其被构成为如果所述确定单元确定了在所述内容的所选择部分中包括文本，则从所述内容的所选择部分中提取所述文本，

其中，所述网络单元仅仅将从所述文本提取单元输出的所提取文本发送到所述第二终端。

12. 根据权利要求 11 所述的第一终端，其中，在将任何内容发送到所述第二终端之前，所述显示器显示用于询问用户是否要将所提取的文本发送到所述第二终端的消息。

13. 一种用于与第二终端合作提供视频会议的方法，该方法包括以下步骤：

由第一终端的显示器显示包括第一窗口和第二窗口的多个窗口，所述第一窗口被构成为显示所述第二终端处的至少一个用户的图像，所述第二窗口被构成为显示所述第一终端的与所述视频会议相关联的内容：

由所述第一终端接收用户对所述第二窗口上显示的内容的一部分的选择；

由所述第一终端的区域选择单元提取所述第二窗口上显示的内容的所选择部分；以及

由所述第一终端将所述内容的所提取部分发送到所述第二终端。

14. 根据权利要求 13 所述的方法，其中，所述第二窗口上显示的内容是图像或文本。

15. 根据权利要求 13 所述的方法，该方法进一步包括以下步骤：

当所述第二窗口上显示的内容包括文本时，在所述第一终端的所述显示器上显示请问是否要将所述文本单独发送到所述第二终端的弹出窗口。

16. 根据权利要求 13 所述的方法，其中，所述多个窗口进一步包括第三窗口，该第三窗口用于显示所述内容的已发送部分在所述第二终端的显示图像。

17. 根据权利要求 13 所述的方法，该方法进一步包括以下步骤：

由所述第一终端对所述内容的所提取部分进行压缩；和 / 或

由所述第一终端对所述内容的所提取部分进行缩放。

18. 根据权利要求 13 所述的方法，其中，显示步骤在弹出窗口中显示所述内容的所提取部分。

19. 根据权利要求 13 所述的方法，该方法进一步包括以下步骤：

由所述第一终端从所述第二终端接收在所述第二终端上显示的已发送的所述内容的所提取部分的画面状态信息；以及

在所述第一终端的所述显示器上显示接收到的画面状态信息。

20. 根据权利要求 13 所述的方法，其中，在显示步骤中，根据用户输入而改变在所述显示器上显示所述多个窗口的方式。

21. 根据权利要求 13 所述的方法，该方法进一步包括以下步骤：

在所述第一终端的所述显示器上显示所述第二终端的显示器的分辨率信息或尺寸信息。

22. 根据权利要求 13 所述的方法，该方法进一步包括以下步骤：

在所述第二窗口上显示指示符，该指示符用于改变要选择的内容部分的尺寸。

23. 根据权利要求 13 所述的方法，该方法进一步包括以下步骤：

由所述第一终端确定在所述内容的所选择部分中是否包括文本；以及

如果确定步骤确定了在所述内容的所选择部分中包括文本，则由所述第一终端从所述内容的所选择部分中提取所述文本，

其中，所述第一终端仅仅将所提取的文本发送到所述第二终端。

24. 根据权利要求 23 所述的方法，该方法进一步包括以下步骤：

在将任何内容发送到所述第二终端之前，在所述第一终端的所述显示器上显示用于询问用户是否要将所提取的文本发送到所述第二终端的消息。

在视频会议系统中共享数据的方法和装置

技术领域

[0001] 本发明涉及在视频会议系统 (VCS) 中共享数据的方法和装置。

背景技术

[0002] 通过除图像传输以外还发送个人计算机 (PC) 的内容，VCS 具有促进视频会议发展的功能。通过在 VCS 中接收 PC 的视频输出信号，按 VCS 能够发送的尺寸来缩放所接收的信号，压缩经过缩放的画面的图像，并且经由网络发送压缩后的图像，从而实现内容传输。

[0003] 通常，由于 PC 的分辨率相对较高，所以 PC 基于 VCS 的图像压缩性能而降低其分辨率。与图像不同，由于内容在很多情况下包括文本，所以当由于降低分辨率的操作导致图像质量较差时，很难识别内容。尤其是，当通过应用于便携式装置的 VCS 功能来观看内容时，由于 PC 画面的缩放度相对较高，所以几乎不能识别文本。

[0004] 因此，非常需要一种方法来解决由于降低分辨率的操作而导致的上述限制。

发明内容

[0005] 本发明的实施方式提供了一种方法和装置，该方法和装置解决当用户和另一方的显示器在视频会议终端中具有各自不同的分辨率和尺寸时与现有技术向相关联的限制。

[0006] 本发明的实施方式还提供了一种方法和装置，该方法和装置通过当用户希望在视频会议系统中与另一方共享数据时仅提供用户利用为另一方的显示器进行了优化的格式所选择的部分，来解决与由于参与视频会议的不同用户的装置之间的不同性能而导致的与现有技术相关联的限制。

[0007] 本发明的实施方式还提供了一种方法和装置，该方法和装置通过考虑用户希望共享的数据是否仅包括文本来减少数据传数量。

[0008] 本发明的实施方式提供了一种用于提供视频会议的方法和装置，该方法和装置解决了与现有技术相关联的限制和缺点。

[0009] 根据实施方式，本发明中提供了一种 VCS 的数据共享方法，其中，如果用户希望与另一方共享数据，则不发送整个画面，而仅将用户选择的区域转换为针对另一方的显示器进行了优化的格式，以便按转换后的格式发送内容。

[0010] 在本发明的一个实施方式中，一种用于视频会议系统的终端包括：显示器，其被构成为显示用户或另一方的图像；用户输入单元，其被构成为接收用户的输入；区域剪切单元，其被构成为检测并捕捉用户选择的图像区域；以及网络单元，其被构成为发送捕捉到的图像区域。

[0011] 在本发明的另一个实施方式中，一种用于视频会议系统的终端包括：用户输入单元，其被构成为接收用户的输入；网络单元，其被构成为接收由另一方从显示在该另一方的显示器上的图像中选择的选择区域的图像；以及显示器，其被构成为显示接收到的所述选择区域的图像。

[0012] 在本发明的另一个实施方式中，一种在视频会议系统中发送数据的方法包括以下

步骤：检测在显示在用户终端的显示器上的图像的区域上的用户选择；捕捉所选择的区域的图像；以及向另一方的终端发送所捕捉到的图像。

[0013] 在本发明另一个实施方式中，一种在视频会议系统中接收数据的方法包括以下步骤：接收由另一方从显示在该另一方的显示器上的图像中选择的选择区域的图像；以及显示接收到的所述选择区域的图像。

[0014] 根据一个实施方式，本发明提供了一种用于与第二终端合作来提供视频会议的第一终端，该第一终端包括：显示器，其被构成为显示包括第一窗口和第二窗口的多个窗口，所述第一窗口被构成为显示所述第二终端的至少一个用户的图像，所述第二窗口被构成为显示与视频会议相关联的所述第一终端的内容；用户输入单元，其被构成为接收对所述第二窗口上显示的内容的一部分的用户选择；区域选择单元，其被构成为提取对所述第二窗口上显示的内容的所选择部分；以及网络单元，其被构成为向所述第二终端发送所述内容的所提取部分。

[0015] 根据另一个实施方式，本发明提供了一种用于与第二终端合作提供视频会议的方法，该方法包括以下步骤：通过第一终端的显示器显示包括第一窗口和第二窗口的多个窗口，所述第一窗口被构成为显示所述第二终端的至少一个用户的图像，所述第二窗口被构成为显示与视频会议相关联的所述第一终端的内容；通过所述第一终端接收对所述第二窗口上显示的内容的一部分的用户选择；通过所述第一终端的区域选择单元提取对所述第二窗口上显示的内容的所选择部分；以及通过所述第一终端向所述第二终端发送所述内容的所提取部分。

[0016] 在以下的附图和描述中阐述了根据本发明的一个或更多个实施方式的细节。根据这些描述和附图，并且根据权利要求，其它特征将更加明显。

附图说明

[0017] 附图被包括进来以提供对本发明的进一步理解，其被并入且构成本说明书的一部分，附图示出了本发明的实施方式，并与说明书一起用于解释本发明的原理。在附图中：

[0018] 图 1 是根据本发明一个实施方式的视频会议系统的结构。

[0019] 图 2 至 5 示出了根据本发明一个实施方式的发送用户终端的显示器上正在显示的用户显示的一部分的方法。

[0020] 图 5 是示出了根据本发明一个实施方式的 VCS 中的所选择区域的数据发送方法的流程图。

[0021] 图 6 是根据本发明一个实施方式的用于显示用户在用户终端 10 上选择的区域的图像的终端结构。

[0022] 图 7 至 9 示出了根据本发明一个实施方式的向用户提供要发送到另一方的图像的反馈的方法。

[0023] 图 10 是示出根据本发明一个实施方式的在将用户选择区域的图像发送到另一方之前或之后向用户提供反馈信息的方法的流程图。

[0024] 图 11 是根据本发明一个实施方式的如果用户选择区域的图像包括文本则基于用户选择仅发送文本的 VCS 的结构。

[0025] 图 12 示出根据本发明一个实施方式的当内容画面中的用户选择区域中存在文本

时确定是否仅向用户发送文本或图像的用户画面。

[0026] 图 13 是示出根据本发明一个实施方式的当在内容画面上显示的图像的用户选择区域中存在文本时仅提取并发送文本的方法的流程图。

具体实施方式

[0027] 现在将详细描述本发明的优选实施方式，在附图中示出了其示例。只要有可能，就在全部附图中使用相同的参考数字表示相同或类似的部件。

[0028] 此后，将参考附图更详细描述本发明的实施方式。

[0029] 图 1 是根据本发明一个实施方式的视频会议系统 (VCS) 的结构。视频会议系统的所有部件都得到有效连接和配置。

[0030] 参考图 1，发送端的用户终端 10 和接收端的另一方终端 20 通过诸如因特网、专用通信网或者其它网络的传输介质而相互交换数据。终端 10 和 20 可以是计算机、输入板 (tablet)、电视、移动终端、手机、智能手机、多媒体装置等。终端 10 和 20 可以是相同类型或不同类型的装置。

[0031] 用户终端 10 包括显示器 15、区域选择单元 11、缩放器 12、图像压缩单元 13、以及网络单元 14。显示器 15 向用户终端 10 处的用户显示视频会议图像。区域选择单元 11 从在显示器 15 的画面上显示的图像中剪切出选择的区域，并将所选择区域的图像作为附加图像临时存储在存储器中。存储器可以是终端 10 中的或者与终端 10 相关联的任何存储单元。缩放器 12 修改所选择区域的图像的分辨率和尺寸以使其适合另一方终端的显示器，从而产生缩放后的图像。图像压缩单元 13 压缩缩放后的图像。网络单元 14 经由传输介质发送压缩后的图像，并从另一方终端 20 接收预定数据，所述传输介质可以是通信网络、类似蓝牙的短距离或近场网络等。

[0032] 另一方终端 20 包括从用户终端 10 接收图像的网络单元 23、对所接收的图像进行解压缩并对图像进行处理的图像解压缩单元 22、以及基于处理后的图像显示视频会议图像的显示器 21。此外，另一方终端 20 可包括用于视频会议的显示单元。各个终端 10 和 20 可进一步包括用来捕捉相互发送的图像的摄像机。即，对于视频会议或其它用途，在用户终端 10 中进行的任何操作（例如，图像捕捉、图像发送、图像接收、区域选择、缩放等）可以在另一方终端 20 中执行，反之亦然。

[0033] 图 1 的视频会议系统用于从用户终端 10 向另一方终端 20 发送视频会议图像。由于在视频会议中实际上可以有多于两个的用户交换图像，所以用户终端 10 包括用于接收会议图像的配置单元，而另一方终端 20 包括用于发送图像的配置单元。此外，用于进行视频会议图像发送和接收的用户终端 10 和另一方终端 20 可以具有相同的结构。

[0034] 此外，可以通过一个专用处理器芯片或通用处理器来执行用户终端 10 和另一方终端 20 的部件功能，并且用户终端 10 和另一方终端 20 可以进一步包括用于处理器操作或其它操作的存储器或其它存储单元。

[0035] 图 2 示出根据本发明一个实施方式的 VCS 中的用户终端 10 的显示器 15 的用户画面 110 的示例。可以在画面 110 的一侧安装摄像机 111，以捕捉用户的图像。例如，用户终端 10 中可以包括摄像机，或者可以使用独立的（可拆卸的）摄像机。摄像机 111 可以安装在能够捕捉用户或者任何其它期望目标的图像的任何地方。

[0036] 用户画面 110 可包括用于表示用户端信息或者另一方信息的多个窗口。更详细地说，用户画面 110 可以包括用于显示另一方图像的另一方图像画面 / 窗口 112，用于显示用户端图像的用户图像画面 / 窗口 113，以及用于显示用户端的内容的用户内容画面 / 窗口 114。例如，另一方图像画面 112 可以显示从终端 20 向用户终端 10 发送的在另一方终端 20 的用户或任何期望目标的图像（例如，在终端 20 处摄像机捕捉的图像）。用户图像画面 113 显示在终端 10 处由摄像机 111 捕捉的图像。内容画面 114 是用于与另一方终端 20 处的另一方一起共享诸如文档、文本、视频、文件等的多媒体数据的窗口。用户内容画面 114 可以是用于除了显示用户端正在发送的图像之外还显示将要发送到在终端 20 处的另一方的多媒体数据的画面，因此，可以显示诸如文字处理器、幻灯片演示 (power point)、PDF 文件的各种格式的文档，还可以显示视频（例如，运动图像、静止图片等）。用户播放连接到用户终端 10 的 PC 或数据库中的内容，并显示它们，并且将用户内容画面 114 上的显示图像发送到另一方终端 20。

[0037] 根据实施方式，可以在终端 10 的画面 110 上提供其它窗口（另一方内容画面），其显示来自另一方的内容（例如，文档、PDF 文件等）。

[0038] 此外，尽管在上述示例中用户与一方进行视频会议，但是用户也可以与多方进行视频会议。在这种情况下，画面 110 可以对于各方都包括上述多个窗口 (112、113 和 114 等）。

[0039] 作为变形，用户终端 10 处的用户可以选择另一方图像画面 112、用户图像画面 113、以及用户内容画面 114 中的一个或更多个以将其包括在用户画面 110 上。例如，用户可以根据用户偏好来配置画面 110 的显示方式。这种情况下，仅在用户画面 110 上显示所选择的画面。例如，用户可以安排仅显示另一方图像画面 112 或者仅显示另一方图像画面 112 和另一方内容画面（例如图 9 中的 124）。

[0040] 根据现有技术，如果使用常规技术将用户内容画面上显示的图像原样发送到另一方终端，那么，由于另一方终端的显示器的最优分辨率和图像尺寸与该用户终端的显示器的最优分辨率和图像尺寸不同，所以可能不能将图像像显示在用户内容画面上一样显示在另一方终端上，并且出现观看的问题。尤其是，如果用户终端的显示器具有较高的性能规格，那么，即使发送在用户内容画面上显示的图像，也不能在另一方终端的显示器上恰当地进行显示。此外，如果发送整个内容画面，则由于还发送了不需要的部分，所以浪费了资源。

[0041] 本发明解决了现有技术的这些局限。根据本发明，用户终端 10 的用户从用户内容画面 114 选择要进行发送的区域。在图 2 中，如果从内容画面 114 用字母 / 文本选择了部分区域 115，则仅向另一方终端 20 发送所选择的部分区域 115。即，选择图 3 中所示的图像，并将其从当前显示在内容画面 114 上的图像中剪切出来然后进行复制，然后，将剪切图像的副本发送到另一方终端 20，以在其中进行存储和 / 或进行显示。无论此操作的情况如何，在内容画面 114 上显示的图像都可以连续显示。如果用户知道另一方终端 20 的显示器 21 的规格低于用户终端 20 的显示器 15 的规格，则选择用户希望发送到另一方的一部分图像，然后进行发送。

[0042] 通过缩放器 12 对选择区域 115 的图像进行缩放以适应另一方显示器 15 的图像尺寸和分辨率，并且通过图像压缩单元 13 对其进行压缩，然后利用网络单元 14 将其发送到另一方终端 20。关于这一点，可以从另一方终端 20 发送有关另一方显示器 21 的信息（例如，

有关对于另一方显示器 21 最优的分辨率和图像尺寸的信息），作为视频会议开始之前提供的系统信息的一部分。

[0043] 根据一个实施方式，当从另一方终端 20 接收了有关另一方显示器 21 的信息时，可以将其显示在用户终端 10 的用户画面 110 上。可以由终端 10 的用户选择是否显示另一方的显示器信息。

[0044] 根据一个实施方式，如图 4 所示，用户内容画面 114 显示指示符 116，该指示符 116 显示对于另一方显示器 21 最优的选择区域的尺寸。可以以很多不同的方式显示指示符 116，例如，当用户选择指定的指示符按钮 / 按键时，当用户在用户内容画面 114 上进行双击时，等等。终端 10 的用户可以移动指示符 116，以对用户希望发送到另一方的部分进行定位。例如，终端 10 的用户可以增大或减小指示符 116 的尺寸，并且 / 或者可以在画面 114 上沿任何方向移动指示符 116，以选择所显示图像的任何期望部分。这可以利用终端 10 的输入单元来完成，例如鼠标、遥控器、控制面板 / 控制台、键盘、软键等。一旦完成了指示符 116 的定位，用户就例如通过在指示符 116 上进行点击 / 选择等，来选择属于适当定位 / 定尺寸的指示符 116 的内容。将用户内容画面 114 的这个选中部分（包括其中显示的内容）指定为用户选择区域。然后，可以对用户选择区域进行缩放和 / 或图像压缩以及用于另一方终端 20 的任何其它处理，然后，例如经由网络单元 14 或者其它装置向另一方终端 20 发送经过处理的用户选择区域，然后将其在显示器 21 进行显示。可以基于用户的选择 / 命令将指示符 116 设置为不可见。

[0045] 根据一个实施方式，如果利用指示符 116 来选择将要按照针对另一方显示器 21 最优的分辨率和图像尺寸进行发送的区域，则可以省略缩放器 12 的缩小处理。

[0046] 结果，根据本发明，另一方终端 20 处的用户可以观看终端 10 处的用户为视频会议选择的部分图像。此操作可以按许多方式用于视频会议。例如，在视频会议期间，终端 10 处的用户可以仅仅将用户显示器 15 上当前显示的全部图像 / 内容的适当部分发送到另一方，以得到更集中的讨论和关注。其进一步减少了视频会议期间的数据传输时间量，这继而减少了等待时间量和视频会议时间量。此外，终端 10 处的用户能够控制另一方可以观看到什么信息。

[0047] 图 5 是示出了根据本发明一个实施方式的 VCS 中的画面的选择区域的数据发送方法的流程图。可以在图 1、6 或 11 的 VCS 中或者在本文讨论的本发明的任何其它 VCS 中实现图 5 的方法以及本文中讨论的本发明的任何其他方法。

[0048] 参考图 5，一旦在操作 S101 中启动 VCS，则在操作 S102 中在用户终端的用户显示器（例如，15）上显示内容画面（例如，用户内容画面 114），以便与另一方共享文档或者诸如视频的多媒体数据。如果用户终端处的用户在操作 S103 中选择内容画面的区域，则在操作 S104 中剪切并复制所选择的区域，并将所选择区域的副本作为附加图像存储在用户终端的存储器中。在操作 S105 中缩小剪切的图像 / 区域，并在操作 S106 中对其进行压缩，然后在操作 S107 中将其发送到另一方终端（例如，20）以进行诸如显示、编辑、存储、复制、传输、记录等的任何处理。根据一个实施方式，如果用户选择的区域具有对于另一方显示器（例如，21）最优的尺寸，则可以省略用户终端处的缩放。

[0049] 根据一个实施方式，在发送到另一方之前，可以在用户终端显示用户终端处的用户希望发送的所选择区域的图像（例如，用于用户终端处的用户进行检验）。

[0050] 图 6 是根据本发明一个实施方式的用于显示用户在用户终端 10 上选择的画面 / 窗口的区域的图像的终端结构。除了将缩放器 12 的输出（反馈）以及图像输入发送到显示器 15 并在其上进行显示之外，此实施方式大致与图 1 的实施方式相同。图 6 的 VCS 的所有部件都得到了有效连接及配置。

[0051] 根据以上结构，如图 7 所示，当用户（例如，终端 10 处的用户）选择区域 115 时，可以在显示器 15 的用户画面之一（例如，用户图像画面 113）上的弹出窗口中显示所选择区域的图像 117。通过这样做，用户可以接收关于是否恰当选择了要发送的图像的反馈。

[0052] 根据一个实施方式，在发送了用户选择区域 117 的图像之后，再次从另一方终端 20 接收关于正在另一方显示器 21 上显示的状态的信息，然后将其显示在用户端画面上。例如，因为在用户显示器 15 上显示正在另一方显示器 21 上显示的图像，所以可以提供所希望的关于是否在另一方显示器 21 上恰当显示了用户选择区域的图像的反馈。

[0053] 另一方终端 20 接收用户选择区域 17 的图像，然后将其显示在显示器 21 上。关于在另一方显示器上对于用户选择区域图像 17 的显示状态的信息可以是在显示器 21 处的上述显示画面的捕捉图像。

[0054] 如图 8 所示，可以在用户终端 10 的另一方图像画面 112 上的弹出窗口（117）中显示从另一方终端 20 接收的反馈信息（即，关于另一方显示器 21 上正在显示的图像的信息）。作为变形，当用户显示器 15 如图 9 所示地单独显示另一方内容画面 124（即，用于显示正在显示器 21 上显示的内容的画面）时，可以在另一方内容窗口 124 上的弹出窗口（117）中显示反馈信息。

[0055] 图 10 是示出根据本发明一个实施方式的提供反馈信息的方法的流程图，所述反馈信息关于在将用户选择区域的图像发送到另一方之前是否恰当选择了用户发送的图像、以及在发送图像之后是否在另一方显示器上恰当显示了图像。可以在图 6 的 VCS 中实现图 10 所示的方法。

[0056] 参考图 6，一旦在操作 S201 中启动了 VCS，就在操作 S202 中在用户终端（例如，10）上显示包括内容画面（例如，114）的用于视频会议的画面。在操作 S203 中，当用户从内容画面中选择了预定区域时，在操作 S204 中在用户显示器（例如，15）的弹出窗口中显示用户选择的区域。一旦用户确认了用户选择区域的图像并确定了将其发送，则在操作 S205 中剪切并复制用户选择区域，然后将副本另外存储在用户终端的存储器中。在操作 S206 中缩小用户选择区域以使其适于另一方的显示器，并在操作 S207 中进行压缩。然后，在操作 S208 中向另一方终端（例如，20）发送压缩后的图像。在操作 S209 中，在用户终端的显示器 15 上显示另一方终端 20 从用户终端 10 接收的图像，然后，再次向用户终端发送所捕捉的显示图像，如图 7 至 9 所示。然后，如图 8 至 9 所示，在操作 S210 中，在显示器 15 上显示所接收的反馈图像。用户确认反馈图像，如果有问题，则再次发送相同的图像，或者从用户终端 10 向另一方终端 20 发送具有不同尺寸的图像。

[0057] 根据一个实施方式，如果在视频会议期间用户希望发送给另一方的图像主要包括文本，那么，仅仅提取文本，然后进行发送。于是，相比图片或视频，文本具有明显小得多的数据传输量，从而可以显著减少视频会议的数据传输所消耗的资源。

[0058] 图 11 是根据本发明一个实施方式的如果用户选择区域的图像包括文本则基于用户选择仅发送文本的 VCS 的结构。图 11 的 VCS 与图 1 和 6 所示的 VCS 类似，但是可以进一

步包括用于单独处理文本的单元。图 11 的 VCS 的所有部件都得到有效连接和配置。

[0059] 如图 11 和 12 所示，用户终端 30 包括显示器 28、区域剪切单元 21、文本确定单元 25、文本提取单元 26、以及文本压缩单元 27。显示器 28 向用户终端 30 处的用户显示图像（如另一方的图像和 / 或内容、用户的内容和 / 或图像等）。区域选择单元 21 剪切出用户从显示在显示器 28 的画面 310 上的画面 / 窗口 112、113、114 等之中的用户内容画面 114 中选择的区域，对其进行复制，然后将剪切区域的副本作为附加图像临时存储在用户终端 30 的存储器中。文本确定单元 25 确定在用户选择区域中是否包括文本。如果确定了在用户选择区域中存在文本，则在用户确定了向另一方仅发送文本之后，文本提取单元 26 从用户选择区域中提取文本。文本压缩单元 27 压缩所提取的文本，或者将所提取的文本转换为用于传输的格式。另外，如果用户确定了发送图像（即，不是仅仅发送文本，而是发送可能包括图片、文本等的全部内容），那么，即使用户选择区域中包括文本或者用户选择区域中没有文本，用户终端 30 也包括：缩放器 22，其用于按对于另一方显示器 41 最优的分辨率和图像尺寸对选择的图像进行缩放；图像压缩单元 23，其用于对缩放后的图像进行压缩，并将其转换为适于传输的格式；以及网络单元 24，其用于发送图像或文本。

[0060] 另一方终端 30 包括用于接收图像和 / 或文本的网络单元 43、用于将图像 / 文本处理为可输出格式的图像和文本解压缩单元 42、以及用于输出经过处理的图像和 / 或文本的显示器 41。如图 1 或 6 中所示，图 11 是根据本发明一个实施方式的用于将用户从用户终端 30 中选择的区域的图像发送到另一方终端 40 的结构。然而，用户终端 30 和另一方终端 40 互相发送和接收数据，从而它们的结构可以相同。此外，可以通过专用处理器或通用处理器 / 控制器来执行上述部件的功能。即，图 1、6 和 11 的各个终端包括控制该终端的所有部件的操作的处理器 / 控制器。

[0061] 图 12 示出显示器 28 的用户画面 310 的示例，该用户画面 310 用于确认当内容画面 114 的用户选择区域中存在文本时是否向另一方仅发送文本还是向另一方发送图像。如图 12 所示，如果文本确定单元 25 确定了用户为传输而选择的用户选择区域 115 中存在文本，则向用户显示询问用户是发送用户选择区域 115 中的图像还是仅发送文本的消息 131。如果用户终端 30 的用户选择了“是”（例如，仅发送文本），则仅从用户选择区域 115 中提取文本，然后向另一方终端 40 仅发送所提取的文本，以进行诸如显示、再现、编辑、记录等的各种处理。接收到文本的另一方终端 40 可以在视频会议期间或之前以适当的格式在显示器 41 上显示该文本。另一方面，如果用户终端 30 的用户选择“否”（例如，发送用户选择区域的全部内容），则使用部件 22 至 24，根据图 1 和 6 所示的方法，对图像（即，用户选择区域的全部图像）进行选择、处理并发送到另一方终端 40。

[0062] 根据上述结构，当用户在视频会议期间希望从用户终端发送到另一方终端的图像仅包括文本时，传输数据量或者传输时间长度都可以得到显著降低。

[0063] 图 13 是示出根据本发明一个实施方式的当用户内容画面上显示的图像的用户选择区域中存在文本时仅提取并发送文本的方法的流程图。可以在图 11 的 VCS 中实现图 13 所示的方法。

[0064] 参考图 13，在操作 S301 中启动 VCS，在操作 S302 中在用户画面（例如，310）上显示各种画面 112、113、114（并且可能有类似 124 的另一方内容画面）。如果用户终端 30 的用户在操作 S303 中在用户内容画面 114 上选择一区域以与另一方共享，则在操作 S304 中，

文本确定单元 25 确定所选择的区域是否包括文本。如果在用户选择区域中存在文本，则在操作 S305 中，通过向用户显示消息（例如，131）来确认是否仅发送文本。如果用户终端 30 的用户选择仅发送文本，则在操作 S306 中，从用户选择区域中仅提取文本，在操作 S307 中将其压缩并 / 或转换为对传输最优化的格式，然后在操作 S308 中将其发送到另一方终端 40。

[0065] 如果在操作 S304 中文本确定单元 25 确定了用户选择区域中不存在文本，或者如果在操作 S305 中用户选择发送用户选择区域的全部图像，则在操作 S309 中，剪切全部的用户选择区域并将其作为附加图像存储在用户终端 30 中。然后，在操作 S310 中，按照对于另一方显示器 41 最优化的分辨率和尺寸缩小所存储的附加图像。接着，在操作 S311 中将缩放后的图像压缩为适于传输的格式，然后在操作 S312 中将其发送到另一方终端 40，以进行显示、记录、存储、再现、编辑、共享等。

[0066] 在图 1、6 和 11 的 VCS 中，部件之间的方向箭头仅是示例，VCS 的所有部件都可以根据需要提供相互双向通信。此外，控制器可以控制各个终端中的这些部件的操作。此外，一个实施方式的特征可以应用于其它实施方式。例如，图 1 所示的指示符 116 同样可以应用于图 6 和 11 所示的 VCS。

[0067] 根据本发明的实施方式，当用户希望对于视频会议或者在视频会议期间与一方或更多方相互共享数据时，仅仅用户选择的数据部分按照针对其他方的显示器最优化的格式来提供，从而可以抵消或者最小化参与视频会议的所有成员的装置之间的性能差异。

[0068] 此外，根据本发明，考虑用户希望共享的数据是否仅包括文本，可以降低传输的数据量或者数据传输时间。

[0069] 尽管已经参考本发明的多个示例性实施方式描述了本发明的实施方式，但是应当理解，本领域技术人员可以设计出落入本发明原理的精神和范围之内的很多其他修改和实施方式。更具体地说，在本公开、附图以及所附权利要求的范围之内，可以就组成部件和 / 或所考虑的组合安排进行各种变化和修改。除了对组成部件和 / 或安排的变化和修改之外，对于本领域普通技术人员，另选的用途也是非常明显的。

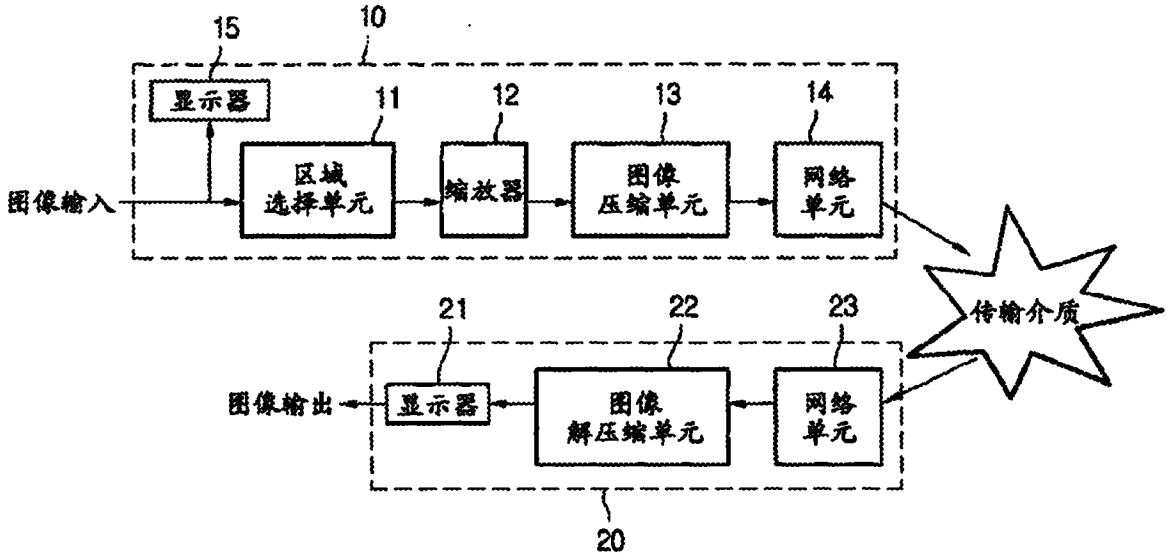

15
10
显示器
11
12
13
14
图像输入
区域选择单元
缩放器
图像压缩单元
网络单元
传输介质
21
22
23
图像输出
显示器
图像解压缩单元
网络单元
20

图 1

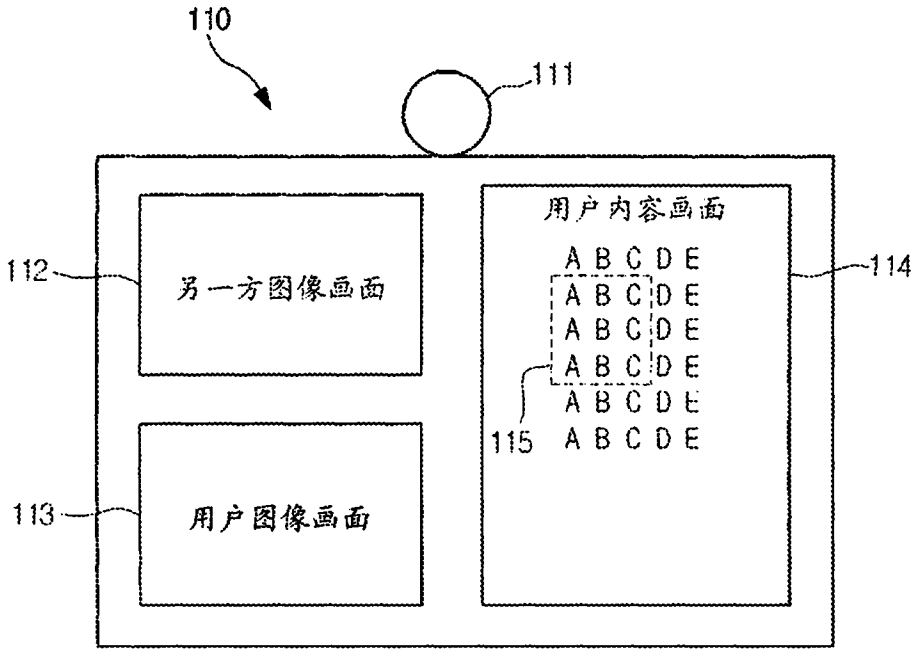

110
111
112
另一方图像画面
用户内容画面
A B C D E
A B C D E
A B C D E
A B C D E
A B C D E
A B C D E
114
115
113
用户图像画面

图 2

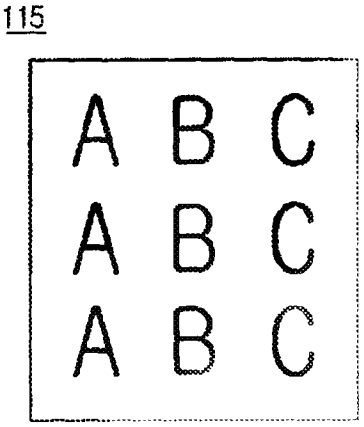

115
A B C
A B C
A B C

图 3

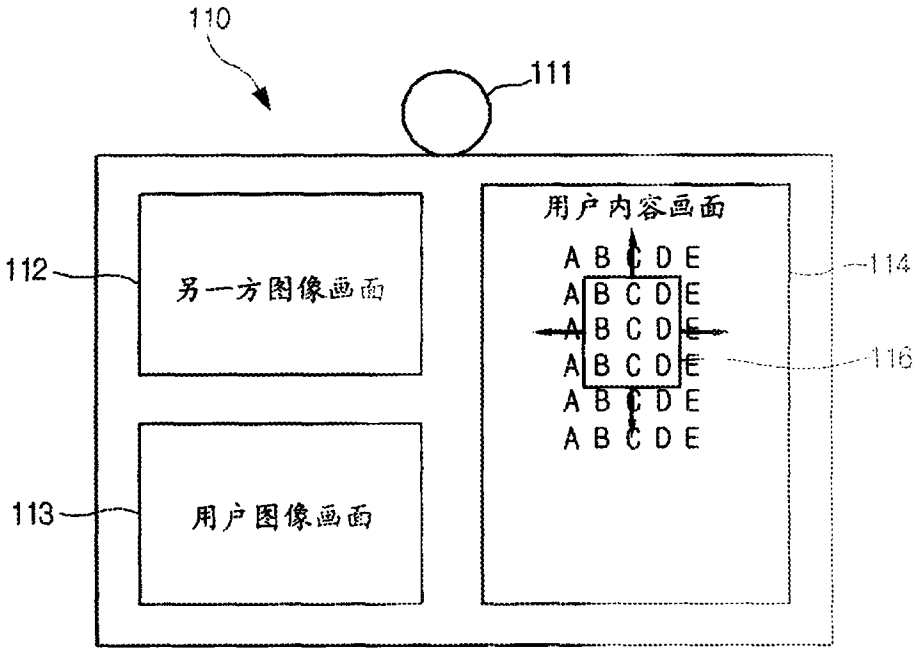

110
111
112
另一方图像画面
113
用户图像画面
用户内容画面
A B C D E
A B C D E
A B C D E
A B C D E
A B C D E
A B C D E
114
116

图 4

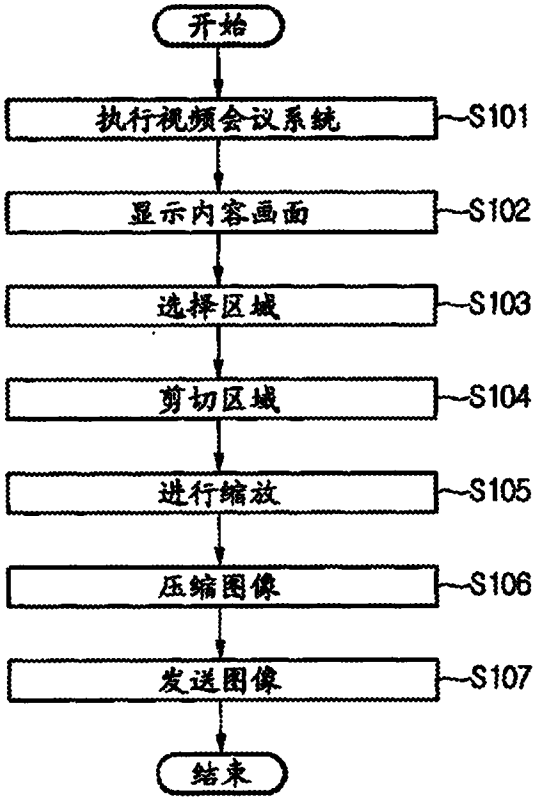

开始
执行视频会议系统
S101
显示内容画面
S102
选择区域
S103
剪切区域
S104
进行缩放
S105
压缩图像
S106
发送图像
S107
结束

图 5

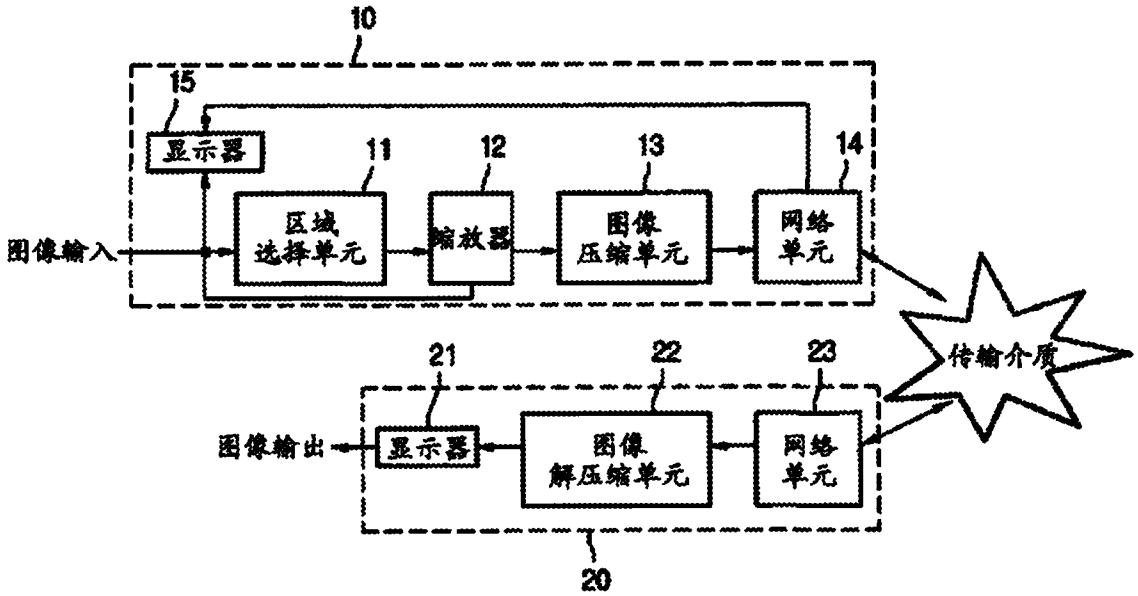

10
15
显示器
11
12
13
14
图像输入
区域选择单元
缩放器
图像压缩单元
网络单元
传输介质
21
22
23
图像输出
显示器
图像解压缩单元
网络单元
20

图 6

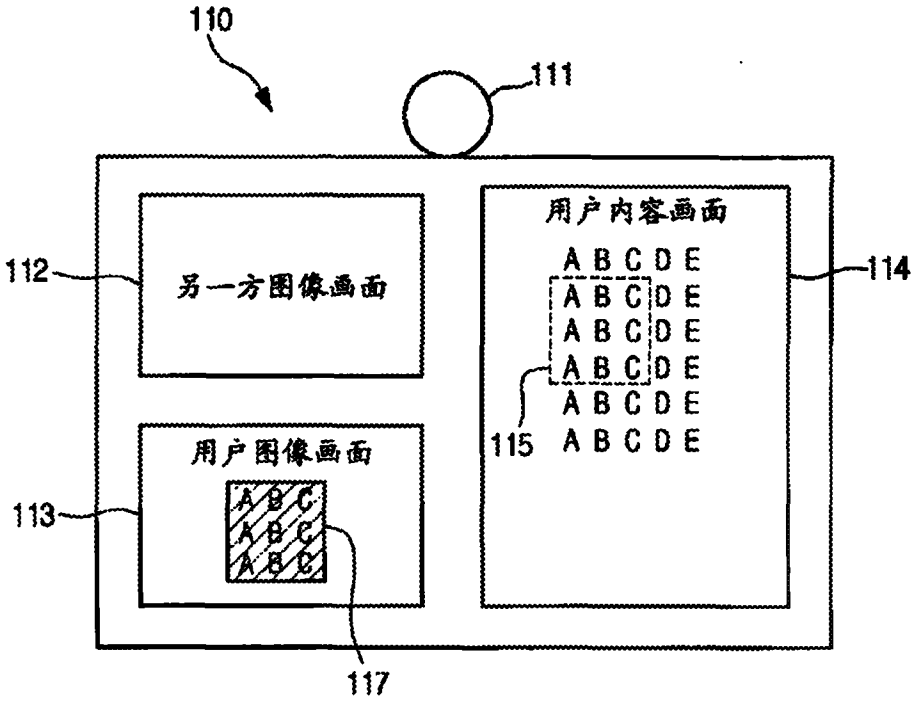

110
111
112
另一方图像画面
用户内容画面
A B C D E
A B C D E
A B C D E
A B C D E
A B C D E
A B C D E
114
115
用户图像画面
113
A B C
A B C
A B C
117

图 7

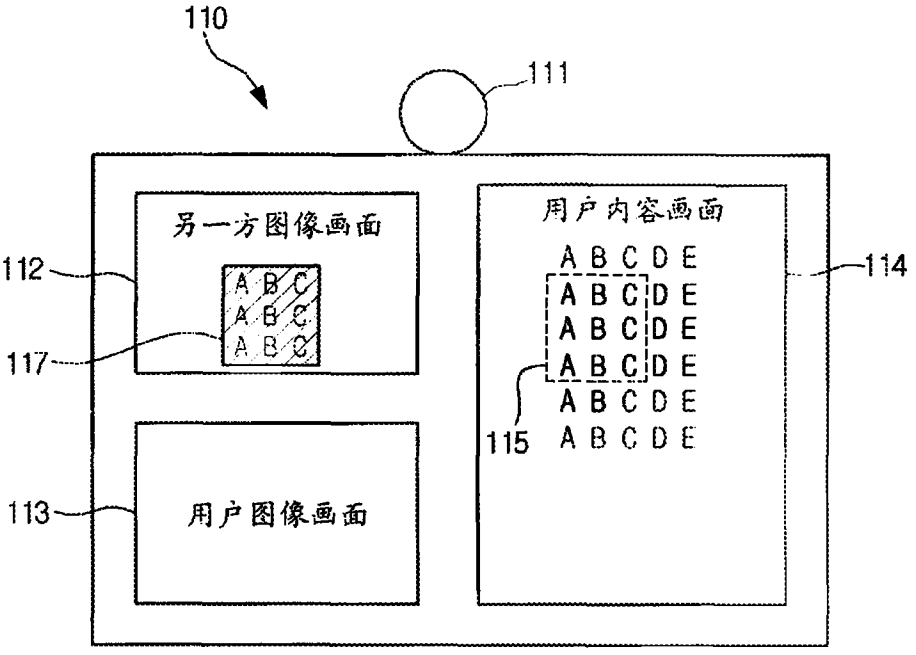

110
111
另一方图像画面
112
A B C
A B C
A B C
117
用户内容画面
A B C D E
A B C D E
A B C D E
A B C D E
A B C D E
A B C D E
114
115
113
用户图像画面

图 8

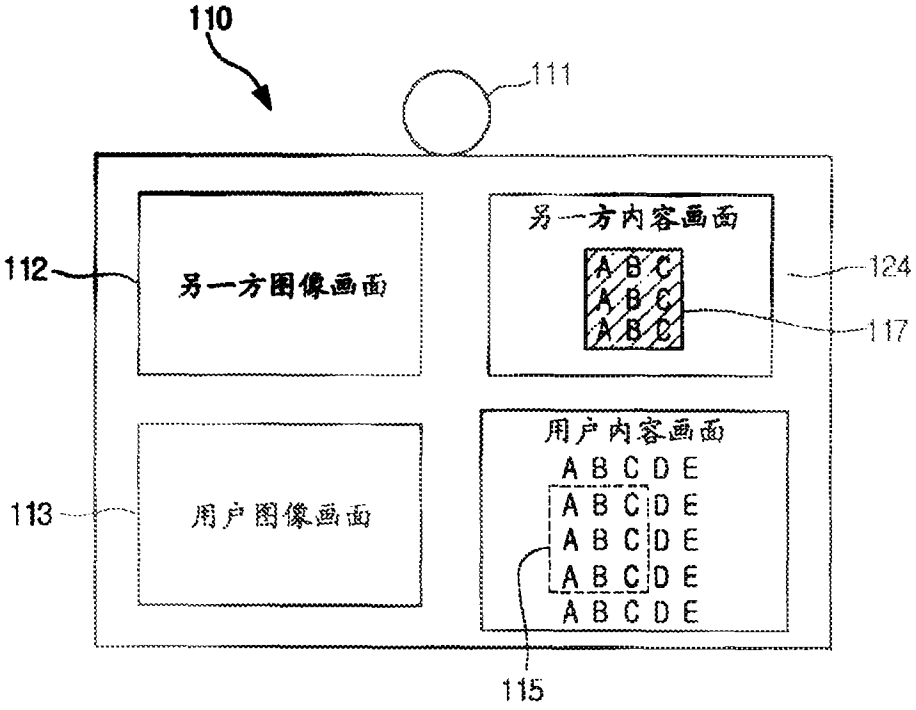

110
111
另一方图像画面
112
另一方内容画面
A B C
A B C
A B C
124
117
用户图像画面
113
用户内容画面
A B C D E
A B C D E
A B C D E
A B C D E
A B C D E
115

图 9

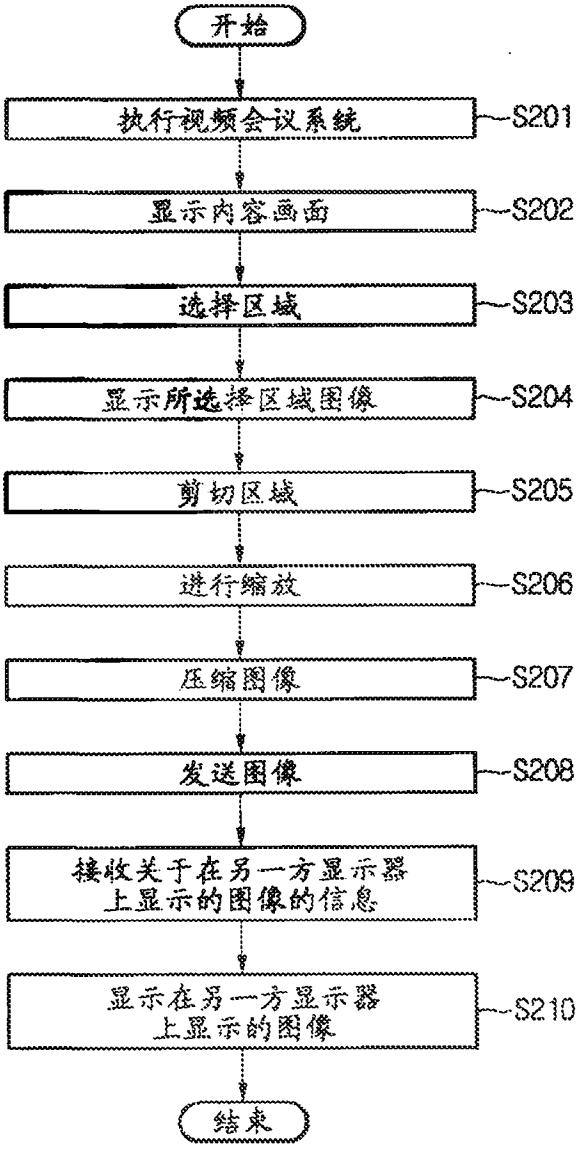

开始
执行视频会议系统
S201
显示内容画面
S202
选择区域
S203
显示所选择区域图像
S204
剪切区域
S205
进行缩放
S206
压缩图像
S207
发送图像
S208
接收关于在另一方显示器上显示的图像的信息
S209
显示在另一方显示器上显示的图像
S210
结束

图 10

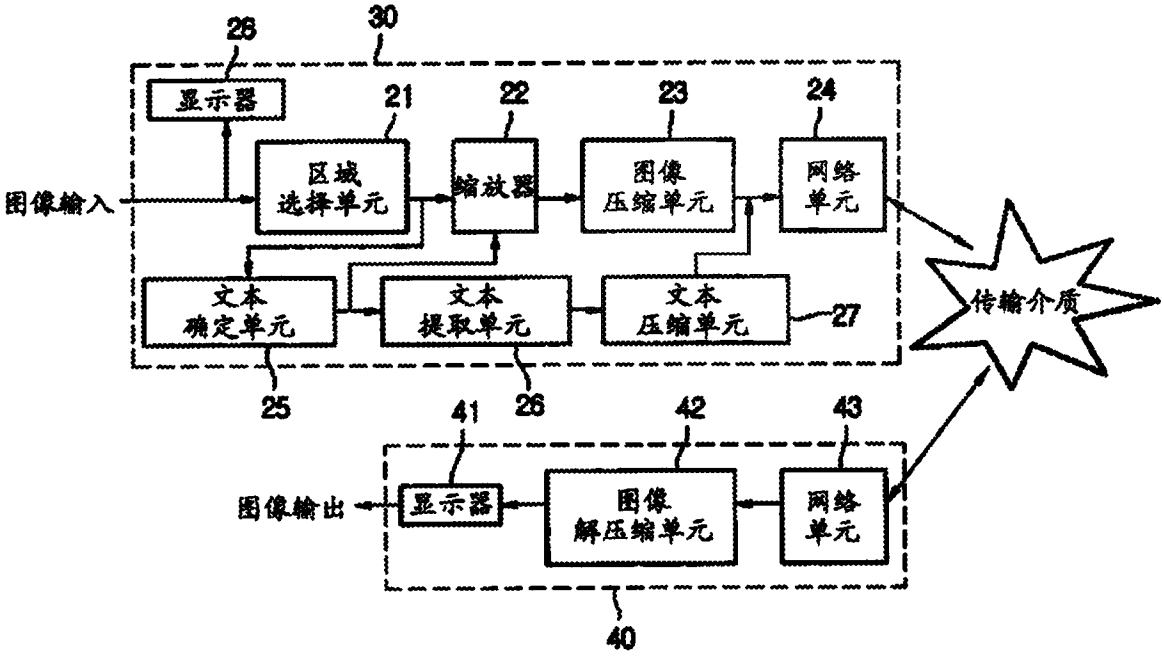

26
30
显示器
21
22
23
24
图像输入
区域选择单元
缩放器
图像压缩单元
网络单元
文本确定单元
文本提取单元
文本压缩单元
27
传输介质
25
26
41
42
43
图像输出
显示器
图像解压缩单元
网络单元
40

图 11

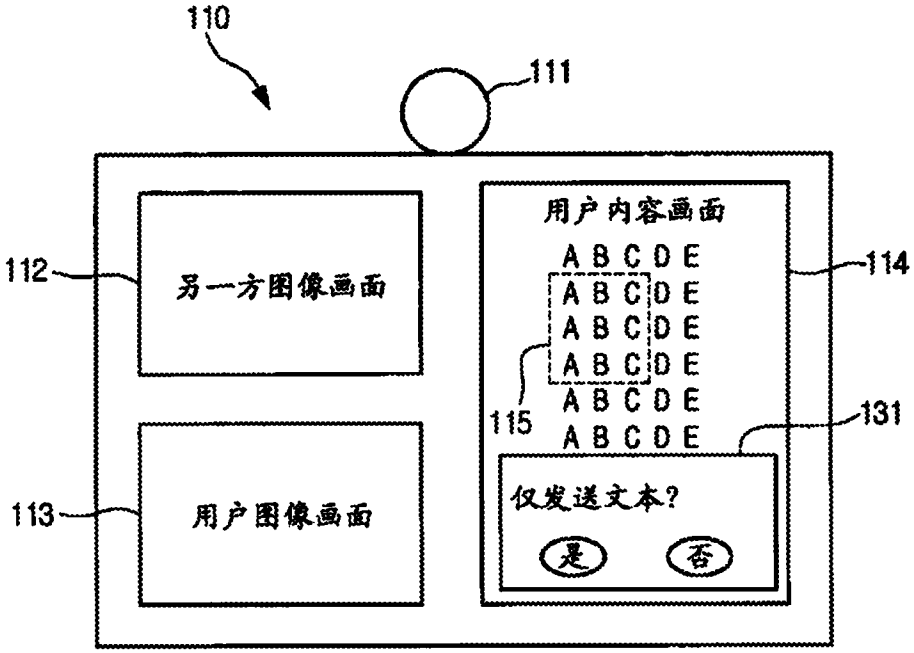

110
111
112
另一方图像画面
用户内容画面
A B C D E
A B C D E
A B C D E
A B C D E
A B C D E
A B C D E
114
115
131
113
用户图像画面
仅发送文本?
是
否

图 12

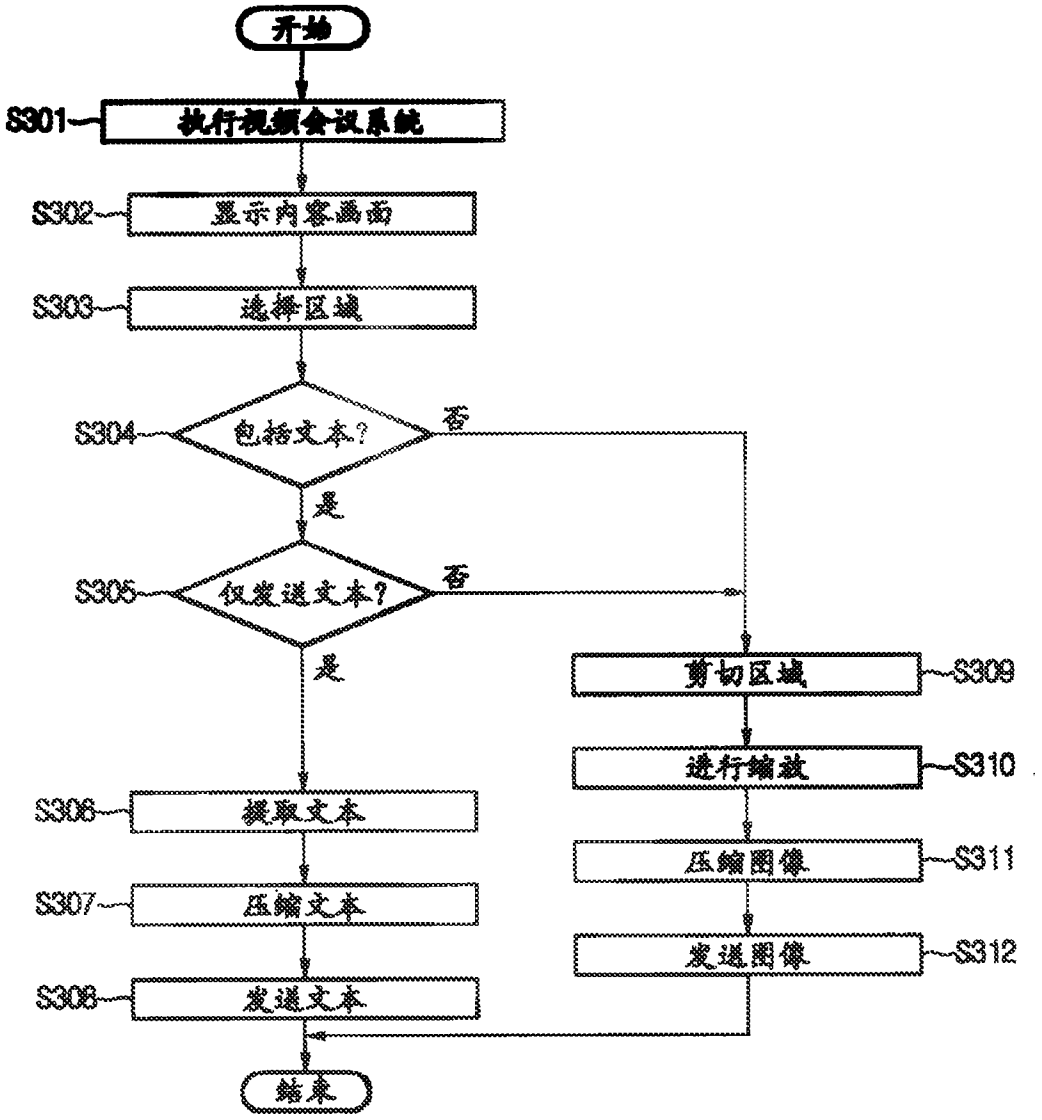

开始
S301
执行视频会议系统
S302
显示内容画面
S303
选择区域
S304
包括文本?
否
是
S305
仅发送文本?
否
是
S306
提取文本
S307
压缩文本
S308
发送文本
结束
剪切区域
S309
进行缩放
S310
压缩图像
S311
发送图像
S312

图 13

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Espacenet

CN1609780A Systems and methods for projecting content from computing devices

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Inventors: FULLER ANDREW J [US],MANION TODD R [US],SOIN RAVIPAL S [US],WILLIAM MAK [US],ZINK RONALD O [US]

Classifications:

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CPC **G06F15/16 (KR); G06F3/14 (KR); G06Q50/10 (KR); G09G5/006 (EP);**

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Systems and methods for projecting content from computing devices

Abstract

Systems and methods are provided hat enable an alternate display device to wirelessly receive content from a computing device, freeing users from the burden of physically connecting the computing device via a cable. The content sent to the display device can also be simultaneously or separately viewed on the computing devices of other nearby computing devices. Generic mechanism(s) and corresponding user interfaces are provided for computing devices to engage in discovery of devices to which content may be delivered, for accepting delivery and for initiating transmission of content.

[19] 中华人民共和国国家知识产权局

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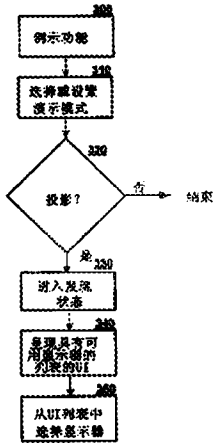
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[54] 发明名称 用于投影来自计算装置的内容的系统和方法

[57] 摘要

提供了系统和方法，使备用显示器装置能够无线地从计算装置接收内容，把用户从物理地经由电缆连接计算装置的负担中解放出来。 要发送给所述显示装置的内容，还可以同时地或独立地在另一个邻近计算装置的计算装置上被观看。 为计算装置提供了通用装置和相应的用户界面，以使其发现内容所要传送的装置，用于接受传送并用于开始内容的发送。



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1. 一种把内容从一个计算装置投影到备用显示器装置的方法，其特征在于，包括：

通过用户界面装置显示对应于可用的备用显示器装置的至少一个指示；

通过用户界面装置，从所述至少一个指示指示出为可用的备用显示器装置中选择至少一个备用显示器装置；以及

把所述内容传送到所选择的至少一个备用显示器装置。

2. 如权利要求 1 所述的方法，其特征在于，还包括：

根据发现协议发现能够接收所述内容的可用的备用显示器装置。

3. 如权利要求 1 所述的方法，其特征在于，所述传送包括，借助于远程协议在所述计算装置和所选的至少一个备用显示器装置之间建立远程对话。

4. 如权利要求 3 所述的方法，其特征在于，所述远程协议是远程桌面协议，所述远程对话是终端服务(TS)对话。

5. 如权利要求 1 所述的方法，其特征在于，还包括：当在所选择的至少一个备用显示器装置上呈现时，指明所述内容的至少一部分要隐藏。

6. 如权利要求 1 所述的方法，其特征在于，所述传送包括，当呈现所述内容时，传送要被呈现在所选择的至少一个备用显示器装置上的附加内容。

7. 如权利要求 6 所述的方法，其特征在于，所述附加内容输入到所述计算装置，以便作为正被呈现的内容上的一个亮点显示。

8. 如权利要求 7 所述的方法，其特征在于，所述附加内容是在所述至少一个备用显示器装置的显示器上被显示成（A）色点、(B)激光指针和(C)带有轨迹的指针中的任一种的所述计算装置的鼠标输入。

9. 如权利要求 1 所述的方法，其特征在于，所述传送包括：

传送对传送内容的请求到所选择的至少一个备用显示器装置中的备用显示器装置；以及

等待来自根据所述传送而允许内容的传送的备用显示器装置的响应。

10. 如权利要求 1 所述的方法，其特征在于，响应于所述传送，所述内容基本上同时地显示在所选择的至少一个备用显示器装置上。

11. 如权利要求 2 所述的方法，其特征在于，所述发现协议是通用即插即用(UPnP)协议。

12. 如权利要求 1 所述的方法，其特征在于，还包括借助于所述用户界面指定根据所述传送而要传送到所选择的至少一个备用显示器装置的内容。

13. 如权利要求 3 所述的方法，其特征在于，还包括，为所述计算装置和所选择的至少一个备用显示器装置之间的每个远程对话，通过用户界面显示与所述远程对话相关联的信号强度的指示。

14. 如权利要求 13 所述的方法，其特征在于，根据障碍物、距离和要维持的数据速率中的至少一个，为每个远程对话示出信号品质的预定水平数。

15. 如权利要求 13 所述的方法，其特征在于，还包括储存与远程对话的信号强度相关联的文件。

16. 一种计算机可读介质，其特征在于，包括计算机可执行模块，具有用于执行权利要求 1 所述的方法的计算机可执行指令。

17. 一种计算装置，其特征在于，包括用于执行权利要求 1 所述的方法的装置。

18. 一种载有用于执行权利要求 1 所述的方法的计算机可执行指令的已调数据信号。

19. 至少一个计算机可读介质，其包括计算机可执行指令，用于实施与具有能够根据至少一个投影协议被投影到其他计算装置上的内容的计算装置的用户相连接的方法，该方法包括：

在计算装置上显示用户界面；

发现是否有至少一个备用显示器装置能够根据所述至少一个投影协议接收该内容；以及

根据所述发现，如果至少一个备用显示器装置能够接收所述内容，则通过所述用户界面显示所述至少一个备用显示器装置的至少一个指示。

20. 如权利要求 19 所述的至少一个计算机可读介质，其特征在于，所述方法还包括：通过所述用户界面选择所述内容。

21. 如权利要求 19 所述的至少一个计算机可读介质，其特征在于，所述发现包括，发现是否有至少一个备用显示器装置能够根据所述至少一个投影协议

接收所述内容。

22.如权利要求19所述的至少一个计算机可读介质，其特征在于，所述发现包括发现对应于所述至少一个备用显示器装置的至少一个网际协议(IP)地址。

23.如权利要求19所述的至少一个计算机可读介质，其特征在于，所述发现包括，检测根据通用即插即用(UPnP)协议通知其存在至少一个备用显示器装置。

24.如权利要求19所述的至少一个计算机可读介质，其特征在于，所述方法还包括：

通过所述用户界面选择所述至少一个指示中的一个指示；以及

控制与所选指示相关联的备用显示器装置的特征。

25.如权利要求24所述的至少一个计算机可读介质，其特征在于，所述控制包括根据远程桌面协议(RDP)进行控制。

26.如权利要求19所述的至少一个计算机可读介质，其特征在于，所述方法还包括：

通过所述用户界面选择所述至少一个指示中的一个指示；以及

创建到与所选指示相关联的备用显示器装置的远程连接。

27.如权利要求26所述的至少一个计算机可读介质，其特征在于，所述方法还包括：

经由所述远程连接，将内容传送到与所选指示相关联的所述备用显示器装置。

28.如权利要求26所述的至少一个计算机可读介质，其特征在于，所述创建包括下述中的至少一个：（A）创建与所述备用显示器装置的终端服务对话，以及(B)创建与通用即插即用(UPnP)技术的远程连接。

29.如权利要求19所述的至少一个计算机可读介质，其特征在于，所述方法还包括：

通过所述用户界面选择所述至少一个指示中的一个指示；以及

破坏到与所选指示相关联的备用显示器装置的远程连接。

30.至少一个计算机可读介质，其包括计算机可执行指令，用于实施与具

有能够显示独立的内容、有效地分散所述计算装置的显示的多个显示器的计算装置的用户相连接，该方法包括：

在所述计算装置的多个显示器中的第一个显示器上显示一用户界面；

根据至少一个扩展协议，发现是否至少一个备用显示器装置能够接收与所述计算装置的多个显示器中的一个显示器的至少一部分相关联的内容；以及

根据所述发现，如果至少一个备用显示器装置能够接收所述内容，则通过所述用户界面显示所述至少一个备用显示器装置的至少一个指示。

31. 如权利要求 30 所述的至少一个计算机可读介质，其特征在于，所述方法还包括：

通过用户界面，选择多个显示器中的一个显示器的至少一部分；

通过所述用户界面选择所述至少一个指示中的一个指示；

创建到与所选指示相关联的备用显示器装置的远程连接；以及

把至少一部分显示经由所述远程连接传送到与所选指示相关联的所述备用显示器装置。

32. 如权利要求 31 所述的至少一个计算机可读介质，其特征在于，所述创建包括创建与所述备用显示器装置的终端服务对话。

33. 如权利要求 31 所述的至少一个计算机可读介质，其特征在于，所述传送包括，传送由至少一部分显示所收到的输入，作为在所述备用显示器装置上的特定指示。

34. 如权利要求 33 所述的至少一个计算机可读介质，其特征在于，所述传送包括，传送由多个显示器中的一个显示器的至少一部分所收到的输入，作为在所述备用显示器装置上的彩色标志。

35. 如权利要求 30 所述的至少一个计算机可读介质，其特征在于，所述发现包括，发现是否有至少一个备用显示器装置能够根据所述至少一个扩展协议接收所述计算装置的至少一部分显示。

36. 如权利要求 30 所述的至少一个计算机可读介质，其特征在于，所述发现包括发现对应于所述至少一个备用显示器装置的至少一个网际协议(IP)地址。

37. 如权利要求 30 所述的至少一个计算机可读介质，其特征在于，所述发