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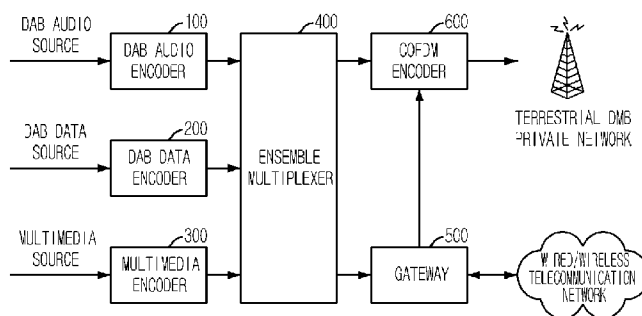
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(54) Title: METHOD FOR TRANSFORMING TERRESTRIAL DMB CONTENTS AND GATEWAY EMPLOYING THE SAME



(57) Abstract: The present invention provides a gateway for transforming a terrestrial digital multimedia broadcasting (DMB) contents. A gateway for transforming a terrestrial DMB contents includes an ensemble transport interface (ETI) demultiplexing unit for dividing the terrestrial DMB contents having ETI frame format into a fast information channel (FIC) and a main service channel (MSC); a session description protocol (SDP) packet processing unit for converting the FIC into a SDP packet; a transmission control protocol/Internet protocol (TCP/IP) packet generating unit for generating a TCP/IP packet based on the SDP packet; a real-time transport protocol (RTP) packet processing unit for converting the MSC into a first RTP packet; a user datagram protocol/Internet protocol (UDP/IP) packet generating unit for generating a UDP/IP packet based on the RTP packet; and an IP output unit for transmitting the TCP/IP packet and the UDP/IP packet through an IP network.

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Description

METHOD FOR TRANSFORMING TERRESTRIAL DMB CONTENTS AND GATEWAY EMPLOYING THE SAME

Technical Field

- [1] The present invention relates to a terrestrial digital multimedia broadcasting (DMB); more particularly, to a method for transforming terrestrial DMB contents, and a gateway employing the same which provides the DMB services through not only a terrestrial DMB private network but also various telecommunication networks efficiently by considering characteristics of various telecommunication networks and formation of the terrestrial DMB contents.

[2]

Background Art

- [3] Generally, a terrestrial digital multimedia broadcasting (DMB) is a digital multimedia broadcasting service providing terrestrial DMB contents, e.g., an audio, a data and multimedia through a terrestrial DMB network when a subscriber is in motion. The terrestrial DMB network is a private network having a low transmission rate implemented by private interface technology, e.g., a service transport interface (STI), an ensemble transport interface (ETI) and EN 300-401 coded orthogonal frequency division multiplexing (COFDM). Herein, a network supporting for the terrestrial DMB is defined as a terrestrial DMB private network.
- [4] In the terrestrial DMB private network, high-compression coded contents are generated for the terrestrial DMB service, the terrestrial DMB contents can be provided through a channel having low transmission rate. Herein, the high-compression coded contents provided through the terrestrial DMB private network is defined as terrestrial DMB contents.
- [5] In the past, the terrestrial DMB contents are provided through the terrestrial DMB private network. However, as the terrestrial DMB service is activated, the terrestrial DMB contents are various. Therefore, request of user who wants to receive the terrestrial DMB contents through the various telecommunication networks as well as the terrestrial DMB private network is increased.
- [6] There was a conventional transportation method of the terrestrial DMB contents through an Internet protocol (IP) network. The conventional transportation method presents IP packetization of the terrestrial DMB contents and transportation of the IP packet through the IP network, abstractly. The conventional transportation method has several problems. First, it does not consider characteristics of various IP networks. In addition, features of multimedia transportation technology through the IP network in

which media information and control information separately transported and formation of the terrestrial DMB contents based on a terrestrial DMB standard are overlooked. That is, it is uncertain whether or not transportation of the terrestrial DMB contents through the IP network is possible. Therefore, a system for providing the terrestrial DMB service through the IP network, which considers characteristics of the various telecommunication networks and the formation of the terrestrial DMB contents, is needed.

[7]

Disclosure of Invention

Technical Problem

[8]

It is, therefore, an object of the present invention to provide a method for transforming terrestrial DMB contents which offers the DMB services through not only a terrestrial DMB private network but also various telecommunication networks efficiently by considering characteristics of various telecommunication networks and formation of the terrestrial DMB contents, and a gateway employing the same.

[9]

Other objects and advantages of the present invention will be clearly understood by the following description and embodiments. Also, it is obvious to those skilled in the art that the objects and advantages of the present invention can be realized by the means as claimed and combinations thereof.

[10]

Technical Solution

[11]

In accordance with one aspect of the present invention, there is provided A gateway for transforming a terrestrial digital multimedia broadcasting (DMB) contents, including: an ensemble transport interface (ETI) demultiplexing unit for dividing the terrestrial DMB contents having ETI frame format into a fast information channel (FIC) and a main service channel (MSC); a session description protocol (SDP) packet processing unit for converting the FIC into a SDP packet; a transmission control protocol/Internet protocol (TCP/IP) packet generating unit for generating a TCP/IP packet based on the SDP packet; a real-time transport protocol (RTP) packet processing unit for converting the MSC into a first RTP packet; a user datagram protocol/Internet protocol (UDP/IP) packet generating unit for generating a UDP/IP packet based on the RTP packet; and an IP output unit for transmitting the TCP/IP packet and the UDP/IP packet through an IP network.

[12]

In accordance with another aspect of the present invention, there is provided A method for transforming a terrestrial digital multimedia broadcasting (DMB) contents, including the steps of: a) demultiplexing the terrestrial DMB contents having ensemble transport interface (ETI) frame format into a fast information channel (FIC) and a main

service channel (MSC); b) converting the FIC into a session description protocol (SDP) packet and generating a transmission control protocol/Internet protocol (TCP/IP) packet based on the SDP packet; c) converting the MSC into an RTP packet and generating a UDP/IP packet based on the RTP packet; and d) transmitting the TCP/IP packet and the UDP/IP packet through an IP network.

- [13] In accordance with another aspect of the present invention, there is provided A terrestrial digital multimedia broadcasting (DMB) contents service system, including: an encoding means for encoding a DAB audio source, a DAB data source and a multimedia source; an ensemble multiplexing means for multiplexing the encoded DAB audio, the encoded DAB data and the encoded multimedia into a terrestrial DMB contents based on a ETI standard; a gateway for transforming the terrestrial DMB contents into packets having a IP format to access IP networks or transporting the terrestrial DMB contents to a coded orthogonal frequency division multiplexing (COFDM) encoding means to access a terrestrial DMB private network; and the COFDM encoding means for encoding the terrestrial DMB contents based on a COFDM and transmitting the encoded terrestrial DMB contents, wherein the gateway demultiplexes the terrestrial DMB contents based on the ETI frame format into a FIC and a MSC, converts the FIC into a packet having the IP format based on a SDP and a TCP/IP, and converts the MSC into a packet having the IP format based on an RTP and a UDP/IP.

[14]

Advantageous Effects

- [15] The present invention can provide a terrestrial DMB services to a user through not only a terrestrial DMB private network but also various telecommunication networks efficiently by considering characteristics of various telecommunication networks and formation of the terrestrial DMB contents.

[16]

Brief Description of the Drawings

- [17] The above and other objects and features of the present invention will become apparent from the following description of the preferred embodiments given in conjunction with the accompanying drawings, in which:

- [18] Fig. 1 is a block diagram illustrating a conventional terrestrial digital multimedia broadcasting (DMB) service system;

- [19] Fig. 2 is a block diagram illustrating a gateway in accordance with an embodiment of the present invention;

- [20] Fig. 3 is a detailed block diagram illustrating a first contents transformer of Fig. 2;

- [21] Fig. 4 is a detailed block diagram illustrating a second contents transformer of Fig.

2;

[22] Fig. 5 is a detailed block diagram illustrating a third contents transformer of Fig. 2;

[23] Fig. 6 is a flowchart illustrating a method for transforming the terrestrial DMB contents in accordance with an embodiment of the present invention;

[24] Fig. 7 is a detailed flowchart illustrating a method for transforming a fast information channel (FIC) of Fig. 6;

[25] Fig. 8 is a detailed flowchart illustrating a method for transforming a main service channel (MSC) of Fig. 6 in accordance with a first embodiment of the present invention;

[26] Fig. 9 is a detailed flowchart illustrating a method for transforming the MSC in accordance with a second embodiment of the present invention; and

[27] Fig. 10 is a detailed flowchart illustrating a method for transforming the MSC in accordance with a third embodiment of the present invention.

[28]

Best Mode for Carrying Out the Invention

[29] Other objects and aspects of the invention will become apparent from the following description of the embodiments with reference to the accompanying drawings, which is set forth hereinafter.

[30] Fig. 1 is a block diagram illustrating a conventional terrestrial digital multimedia broadcasting (DMB) service system.

[31] As shown, the terrestrial DMB service system of the present invention includes a digital audio broadcasting (DAB) audio encoder 100, a DAB data encoder 200, a multimedia encoder 300, an ensemble multiplexer 400, a gateway 500 and a coded orthogonal frequency division multiplexing (COFDM) encoder 600.

[32] The DAB audio encoder 100, the DAB data encoder 200 and the multimedia encoder 300 encode a DAB audio source, a DAB data source and a multimedia source, respectively, based on a digital multimedia broadcasting (DMB) standard to thereby generate coded DAB audio, coded DAB data and coded multimedia.

[33] The ensemble multiplexer 400 multiplexes the coded DAB audio encoded in the DAB audio encoder 100, the coded DAB data encoded in the DAB data encoder 200 and the coded multimedia encoded in the multimedia encoder 300 into ensemble transport interface (ETI) frames and outputs the ETI frame to the gateway 500. The ETI frame includes a main service channel (MSC), a fast information channel (FIC) and an ETI header. The MSC includes terrestrial DMB contents information, i.e. DAB audio information, DAB data information and multimedia information. The FIC includes control information, i.e. construction information and service information of the terrestrial DMB contents, for controlling the terrestrial DMB contents. The ETI

header includes general construction information of the ETI frame. That is, the terrestrial DMB contents are generated based on a format of the ETI frame including the MSC, the FIC and the ETI header based on the terrestrial DMB standard.

- [34] The gateway 500 transmits the terrestrial DMB contents generated by a format of the ETI frame to the COFDM encoder 600 or transforms the terrestrial DMB contents into packets having an Internet protocol (IP) format based on a network accessed by the terrestrial DMB service system. In DMB private network, the gateway 500 bypasses the terrestrial DMB contents to the COFDM encoder 600. Then, the COFDM encoder 600 encodes the terrestrial DMB contents based on a COFDM format and transmits the encoded terrestrial DMB contents through the DMB private network. Otherwise, in various telecommunication networks based on IP except the DMB private network, the gateway 500 transforms the terrestrial DMB contents generated based on a format of the ETI frame into a format of IP in the various telecommunication networks. Particular diagram of the gateway will be described in detail referring to Figs. 2 to 5.
- [35] That is, the terrestrial DMB service system provides the terrestrial DMB contents through the terrestrial DMB private network and various telecommunication networks by adding the terrestrial DMB contents transforming gateway 500.
- [36] Fig. 2 is a block diagram illustrating the gateway in accordance with an embodiment of the present invention.
- [37] As shown, when the terrestrial DMB service system accesses the terrestrial DMB private network, the gateway 500 bypasses the terrestrial DMB contents generated by the ETI frame format. Therefore, a user terminal, i.e., a terrestrial DMB private terminal, accessing the terrestrial DMB private network can be served by a conventional terrestrial DMB service system without the added gateway 500.
- [38] Herein, since the terrestrial DMB service system in accordance with the present invention may access not only the terrestrial DMB private network but also the various telecommunication networks, the gateway 500 includes a plurality of contents transformers, in order to transform the terrestrial DMB contents based on characteristics of the various telecommunication networks. For example, the various telecommunication networks may be a wired Internet, a wireless Internet, e.g., a wireless LAN, a wibro, a mobile telecommunication network, e.g., a code division multiple access (CDMA) and a global system for mobile communications (GSM). The wired Internet is the most stable and has high transmission bandwidth, and the mobile telecommunication network is the most unstable and has low transmission bandwidth. That is, the gateway 500 must be designed to support each telecommunication network for transforming the terrestrial DMB contents efficiently considering the characteristics of telecommunication networks described above.

- [39] For example, the gateway 500 includes three contents transformers, i.e., a first contents transformer 210, second contents transformer 220 and third contents transformer 230. Hereinafter, the first contents transformer 210, second contents transformer 220 and the third contents transformer 230 are described corresponding to the wired Internet, the wireless Internet and the mobile telecommunication network, respectively.
- [40] Fig. 3 is a detailed block diagram illustrating a first contents transformer of the Fig. 2.
- [41] As shown in Fig. 3, the first contents transformer 210 include a ETI demultiplexing unit 301, a session description protocol (SDP) packet processing unit 302, a transmission control protocol/Internet protocol (TCP/IP) generating unit 303, a real-time transport protocol (RTP) packet processing unit 304, a user datagram protocol/Internet protocol (UDP/IP) generating unit 305, and an IP output unit 306. As described above, the first contents transformer is designed for supporting the wired Internet.
- [42] When the telecommunication network is decided as the wired Internet, the terrestrial DMB contents having an ETI frame format are inputted to the first contents transformer 210.
- [43] The ETI frame includes a MSC having information of the terrestrial DMB contents, a FIC having control information of the terrestrial DMB contents and an ETI header having construction information of the ETI frame.
- [44] The ETI demultiplexing unit 301 analyzes the ETI header of the inputted ETI frame, demultiplexes the ETI frame into the MSC and the FIC, and outputs the FIC into the SDP packet processing unit 302 and the MSC into the RTP packet processing unit 304, respectively.
- [45] The SDP packet processing unit 302 forms a SDP packet based on the inputted FIC. Herein, the SDP packet is generated based on the SDP which is a protocol describing session in Internet multimedia transmission technology. The SDP packet includes session information of the terrestrial DMB contents, e.g., a name and a purpose of a session, creator information of the session, media information for the session and information needed to transmit media e.g., address, port, format. That is, the SDP packet includes the session information as well as the control information of the terrestrial DMB contents which is included in the FIC. The session information for the SDP packet is inputted by a user terminal and saved in a predetermined database. Therefore, the SDP packet is generated based on the session information and the control information of the FIC.
- [46] The TCP/IP generating unit 303 receives the SDP packet inputted from the SDP packet processing unit 302, generates the TCP/IP packet and outputs the TCP/IP

packet into the IP output unit 306 for transmitting the SDP packet by IP format. Then, the IP output unit 306 transmits the TCP/IP packet through the wired Internet. That is, the SDP and the TCP/IP are used for transforming the FIC into the packet having the IP format.

[47] Meanwhile, the RTP packet processing unit 304 receives the MSC and forms the RTP packet. Herein, the RTP packet is generated based on the RTP which is a protocol transmitting media in Internet multimedia transmission technology. The RTP packet includes information of the terrestrial DMB contents, e.g., DAB audio information, DAB data information, multimedia information. In the present invention, the RTP packet is generated by considering transmission characteristics of the terrestrial DMB contents. That is, size and payload type information of the RTP packet are setup for transmission of the terrestrial DMB contents. For example, the size of the RTP packet is defined by on the basis of 8 bytes as the same as the terrestrial DMB contents, and a payload type of the RTP packet may be decided as the terrestrial DMB contents.

[48] The UDP/IP generating unit 305 receives the RTP packet inputted from the RTP packet processing unit 304, generates the UDP/IP packet and outputs the UDP/IP packet into the IP output unit 306 for transmitting the RTP packet by IP format. Then, the IP output unit 306 transmits the UDP/IP packet through the wired Internet. That is, the RTP and the UDP/IP are used for transforming the MSC into the packet having the IP format.

[49] As described above, the terrestrial DMB contents are divided by media information and the control information of the terrestrial DMB contents. The media information of the terrestrial DMB contents is transformed by the RTP which is a protocol for transmitting media in the Internet multimedia transmission technology, and the control information of the terrestrial DMB contents is transformed by the SDP which is a protocol describing session in the Internet multimedia transmission technology. Therefore, the terrestrial DMB service system can be realized suitable for the characteristics of the Internet multimedia transmission technology, the media information and the control information of the terrestrial DMB contents are separately transmitted.

[50] Fig. 4 is a detailed block diagram illustrating a second contents transformer of Fig. 2.

[51] As shown, the second contents transformer 220 includes an ETI demultiplexing unit 401, a SDP packet processing unit 402, a TCP/IP generating unit 403, a MSC demultiplexing unit 404, an outer coding unit 405, an RTP packet processing unit 406, a UDP/IP generating unit 407, and an IP output unit 408. As described above, the second contents transformer is designed for supporting wireless Internet.

[52] Herein, the ETI demultiplexing unit 401, the SDP packet processing unit 402, the TCP/IP generating unit 403, the RTP packet processing unit 406, the UDP/IP

generating unit 407, and the IP output unit 408 perform the same functions as the ETI demultiplexing unit 301, the SDP packet processing unit 302, the TCP/IP generating unit 303, the RTP packet processing unit 304, the UDP/IP generating unit 305, and the IP output unit 306 of Fig. 3, respectively.

[53] Since the second contents transformer 220 is corresponding to the wireless Internet which is unstable and has narrower bandwidth than the wired Internet, an additional decoding procedure of the MSC is needed for improving transmission efficiency. The second contents transformer 220 divides the MSC into sub channels, i.e., a DAB audio stream, a DAB data stream and a multimedia stream and transforms each of the sub channels.

[54] The MSC demultiplexing unit 404 receives the MSC from the ETI demultiplexing unit 401 and demultiplexes the MSC into the DAB audio stream, the DAB data stream and the multimedia stream. The RTP packet processing unit 406 generates an RTP packet based on the DAB audio stream and the DAB data stream. Then, the UDP/IP generating unit 407 generates a UDP/IP packet based on the RTP packet and output the UDP/IP packet to the IP output unit 408.

[55] On the other hand, the multimedia stream is outer-decoded in the outer decoding unit 405. Herein, the outer-decoding is the deletion procedure of unnecessary bytes in the multimedia stream. Since the multimedia stream includes additional bytes by an outer-coding, the additional bytes do not necessary for IP transmission. For example, when the multimedia stream is a MPEG-2 transport stream (TS), the outer decoding unit 405 receives the MPEG-2 multimedia TS of which size is increased into 204 bytes by the outer-coding and generates a 188-byte MPEG-2 multimedia TS by the outer-decoding.

[56] The RTP packet processing unit 406 generates the RTP packet based on the outer-decoded multimedia stream. The UDP/IP generating unit 407 generates the UDP/IP packet based on the RTP packet, and output the UDP/IP packet into the IP output unit 408.

[57] As described above, the second contents transformer 220 divides the MSC into sub channels, converts and transmits each of the sub channels. Especially, the second contents transformer 220 decreases the size of the multimedia TS by using additional outer-decoding. Therefore, the second contents transformer 220 is needed for wireless Internet which is unstable and has narrower bandwidth than the wired Internet.

[58] Fig. 5 is a detailed block diagram illustrating a third contents transformer of Fig. 2.

[59] As shown, the third contents transformer 220 include a ETI demultiplexing unit 501, a SDP packet processing unit 502, a TCP/IP generating unit 503, a MSC demultiplexing unit 504, an outer coding unit 505, a multimedia stream analyzing/de-multiplexing unit 506, a video elementary stream (ES) generating unit 507, an audio

ES generating unit 508, an RTP packet processing unit 509, a UDP/IP generating unit 510, and an IP output unit 511. As described above, the third contents transformer is designed for supporting a mobile telecommunication network.

- [60] Herein, the ETI demultiplexing unit 501, the SDP packet processing unit 502, the TCP/IP generating unit 503, the RTP packet processing unit 509, the UDP/IP generating unit 510, and the IP output unit 511 perform the same functions as the ETI demultiplexing units 301 and 401, the SDP packet processing units 302 and 402, the TCP/IP generating units 303 and 403, the RTP packet processing units 304 and 406, the UDP/IP generating units 305 and 407, and the IP output units 306 and 408 shown in Figs. 3 and 4, respectively. Moreover, the MSC demultiplexing unit 504 and the outer coding unit 505 perform the same functions as the MSC demultiplexing unit 404 and the outer coding unit 405 of Fig. 4, respectively.
- [61] Since the third contents transformer 230 is corresponding to the mobile telecommunication network which is unstable and has narrower bandwidth than the wired Internet and the wireless Internet, an additional decoding procedure of the multimedia outputted from the outer decoding unit 505 is needed. The third contents transformer 230 divides the multimedia stream into an audio stream and a video stream and transforms them.
- [62] The multimedia stream analyzing/demultiplexing unit 506 receives the multimedia transport stream from the outer decoding unit 505, analyzes the multimedia stream and demultiplexes the multimedia stream into a video transport stream (TS) and an audio TS.
- [63] The video ES generating unit 507 receives the video TS from the multimedia stream analyzing/demultiplexing unit 506 and generates a video ES by demultiplexing and de-packetization of the video TS. The RTP packet processing unit 509 receives the video ES and generates an RTP packet based on the video ES. Then, the UDP/IP generating unit 510 receives the RTP packet, generates the UDP/IP packet based on the RTP packet and outputs the UDP/IP packet into the IP output unit 511.
- [64] Meanwhile, the audio ES generating unit 508 receives the audio TS from the multimedia stream analyzing/demultiplexing unit 506 and generates an audio ES by demultiplexing and depacketization of the audio TS. The RTP packet processing unit 509 receives the audio ES and generates an RTP packet based on the audio ES. Then, the UDP/IP generating unit 510 receives the RTP packet, generates the UDP/IP packet based on the RTP packet and outputs the UDP/IP packet into the IP output unit 511.
- [65] As described above, the third contents transformer 230 divides the multimedia stream into the video TS and the audio TS, and generates the video ES and the audio ES by performing additional decoding of the video TS and the audio TS to thereby decrease data size. Therefore, the third contents transformer 230 is suitable to support

terrestrial telecommunication network which is unstable and has narrower bandwidth than the wireless Internet.

[66] Fig. 6 is a flowchart illustrating a method for transforming the terrestrial DMB contents in accordance with an embodiment of the present invention.

[67] First, the terrestrial DMB contents having an ETI frame format are demultiplexed into a FIC and a MSC at step S601. Herein, the step S601 is performed identically in transforming the terrestrial DMB contents for all types of networks. That is, the terrestrial DMB contents are divided into the FIC (control information) and the MSC (media information) according to the characteristics of the Internet multimedia transportation technology.

[68] At step S602, the FIC is converted into a packet of IP format to access telecommunication network based on the IP. Herein, the step S602 is performed identically in transforming the terrestrial DMB contents for all types of networks. Below, the FIC conversion procedure is described in detail referring to Fig. 7.

[69] At step S603, the MSC is converted into a packet of IP format to access telecommunication network based on the IP. Herein, the MSC conversion procedure is performed differently in transforming the terrestrial DMB contents for each type of networks. In the present invention, three MSC conversion procedures are described corresponding to the wired Internet, the wireless Internet and the mobile telecommunication network. Below, the three MSC conversion procedures are described in detail referring to Figs. 8 to 10.

[70] At step S604, the packet of the IP format converted at the steps S602 and S603 is transmitted into the IP network. Then, transformation of the terrestrial DMB contents is terminated.

[71] Fig. 7 is a detailed flowchart illustrating a method for transforming a fast information channel (FIC) of Fig. 6.

[72] First, control information of the terrestrial DMB contents is extracted in the FIC at step S701.

[73] At step S702, a SDP packet is generated based on the extracted control information and predetermined session information from a user terminal, because session information needed for the SDP packet includes not only the FIC but also additional information.

[74] Next, a TCP/IP packet is generated by using the SDP packet at step S703. That is, the FIC conversion procedure S602 of Fig. 6 is terminated.

[75] Fig. 8 is a detailed flowchart illustrating a method for transforming a main service channel (MSC) of Fig. 6 in accordance with a first embodiment of the present invention.

[76] First, the RTP packet is produced based on the MSC at step S801. As described

above, the size of the RTP packet is defined on the basis of 8 bytes as the same as the terrestrial DMB contents, and the payload type of the RTP packet may be decided by a type of the terrestrial DMB contents.

[77] At step S802, the UDP/IP packet is generated based on the RTP packet. That is, the MSC conversion procedure S603 of Fig. 6 needed to access the wired Internet is terminated.

[78] Fig. 9 is a detailed flowchart illustrating a method for transforming the MSC in accordance with a second embodiment of the present invention.

[79] First, the MSC is demultiplexed into a DAB audio stream, a DAB data stream and a multimedia stream at step S803. Then, the multimedia stream is outer-decoded at step S804.

[80] At step S805, the RTP packet is produced based on the demultiplexed DAB audio stream and the demultiplexed DAB video stream at step S803 and the outer-decoded multimedia stream at step S804. Herein, the RTP packet is generated by considering the characteristics of the terrestrial DMB contents transportation technology.

[81] At step S806, the UDP/IP packet is generated based on the RTP packet. That is, the MSC conversion procedure S603 needed to access the wireless Internet is terminated.

[82] Fig. 10 is a detailed flowchart illustrating a method for transforming the MSC in accordance with a third embodiment of the present invention.

[83] First, the MSC is demultiplexed into a DAB audio stream, a DAB data stream and a multimedia stream at step S807 as the same as step S803. Then, the multimedia stream is outer-decoded at step S808 as the same as step S804.

[84] At step S809, the outer-decoded multimedia stream is demultiplexed into a video transport stream (TS) and an audio transport stream (TS). Then, a video elementary stream (ES) and an audio elementary stream (ES) are generated based on the video TS and the audio TS at step S810.

[85] At step S811, the RTP packet is produced based on the demultiplexed DAB audio stream and the demultiplexed DAB video stream demultiplexed at step S807, the video ES and the audio ES generated at step S810. At step S812, the UDP/IP packet is generated based on the RTP packet. That is, the MSC conversion procedure S603 needed to access the mobile telecommunication network is terminated.

[86] Referring to Figs. 8 to 10, the MSC including the media information is decoded in accordance with the characteristics of network, i.e., stability and transportation bandwidth, differently. Therefore, the terrestrial DMB contents can be transported to a variety of IP networks efficiently.

[87] The above described method according to the present invention can be embodied as a program and be stored on a computer readable recording medium. The computer readable recording medium is any data storage device that can store data which can be

read by the computer system. The computer readable recording medium includes a read-only memory (ROM), a random-access memory (RAM), a CD-ROM, a floppy disk, a hard disk and an optical magnetic disk.

[88] The present application contains subject matter related to Korean patent application Nos. 2006-0061225 and 2006-0094380, filed with the Korean Intellectual Property Office on June 30, 2006, and September 27, 2006, respectively, the entire contents of which is incorporated herein by reference.

[89] While the present invention has been described with respect to certain preferred embodiments, it will be apparent to those skilled in the art that various changes and modifications may be made without departing from the scope of the invention as defined in the following claims.

Claims

- [1] A gateway for transforming a terrestrial digital multimedia broadcasting (DMB) contents, comprising:
an ensemble transport interface (ETI) demultiplexing means for dividing the terrestrial DMB contents having ETI frame format into a fast information channel (FIC) and a main service channel (MSC);
a session description protocol (SDP) packet processing means for converting the FIC into a SDP packet;
a transmission control protocol/Internet protocol (TCP/IP) packet generating means for generating a TCP/IP packet based on the SDP packet;
a real-time transport protocol (RTP) packet processing means for converting the MSC into a first RTP packet;
a user datagram protocol/Internet protocol (UDP/IP) packet generating means for generating a UDP/IP packet based on the RTP packet; and
an IP output means for transmitting the TCP/IP packet and the UDP/IP packet through an IP network.
- [2] The gateway as recited in the claim 1, wherein the RTP packet processing means includes:
an MSC demultiplexing block for demultiplexing the MSC into a digital audio broadcasting (DAB) audio stream, a DAB data stream and a multimedia stream;
an outer decoding block for performing outer decoding of the multimedia stream to thereby generate outer-decoded multimedia stream; and
an RTP packet processing block for forming a second RTP packet based on the DAB audio stream, the DAB data stream and the outer-decoded multimedia stream.
- [3] The gateway as recited in the claim 2, wherein the RTP packet processing block includes:
a multimedia stream analyzing and demultiplexing unit for demultiplexing the outer-decoded multimedia stream into a video transport steam (TS) and an audio TS by analyzing the outer-decoded multimedia stream;
an elementary stream (ES) generating unit for receiving the video TS and the audio TS, and generating a video ES and an audio ES, respectively; and
an RTP packet processing unit for forming a third RTP packet based on the DAB audio stream and the DAB data stream from the MSC demultiplexing block and the video ES and the audio ES from the ES generating unit.
- [4] The gateway as recited in the claim 1, wherein the SDP packet processing means forms the SDP packet based on information included in the FIC and additional

- session information.
- [5] The gateway as recited in the claim 1, wherein the RTP packet processing means forms an RTP packet having the same size as the terrestrial DMB contents, and decides a payload type of the RTP packet as the terrestrial DMB contents.
- [6] A method for transforming a terrestrial digital multimedia broadcasting (DMB) contents, comprising the steps of:
- a) demultiplexing the terrestrial DMB contents having ensemble transport interface (ETI) frame format into a fast information channel (FIC) and a main service channel (MSC);
 - b) converting the FIC into a session description protocol (SDP) packet and generating a transmission control protocol/Internet protocol (TCP/IP) packet based on the SDP packet;
 - c) converting the MSC into an RTP packet and generating a UDP/IP packet based on the RTP packet; and
 - d) transmitting the TCP/IP packet and the UDP/IP packet through an IP network.
- [7] The method as recited in the claim 6, wherein the SDP packet is formed based on information included in the FIC and additional session information.
- [8] The method as recited in the claim 6, wherein the step c) includes the steps of:
- c1) demultiplexing the MSC into a DAB audio stream, a DAB data stream and a multimedia stream;
 - c2) performing outer decoding of the multimedia stream;
 - c3) forming a first RTP packet based on the DAB audio stream, the DAB data stream and the outer-decoded multimedia stream; and
 - c4) generating an UDP/IP packet based on the RTP packet.
- [9] The method as recited in the claim 8, wherein the step c3) includes the steps of:
- c3-1) demultiplexing the outer-decoded multimedia stream into a video TS and an audio TS by analyzing the outer-decoded multimedia stream;
 - c3-2) generating a video ES and the audio ES by using the video TS and the audio TS, respectively; and
 - c3-3) forming a second RTP packet based on the DAB audio stream, the DAB data stream, the video ES and the audio ES.
- [10] The method as recited in the claim 6, wherein the RTP packet has the same size as the terrestrial DMB contents, and a payload type of the RTP packet is the terrestrial DMB contents type.
- [11] A terrestrial digital multimedia broadcasting (DMB) contents service system, comprising:
- an encoding means for encoding a DAB audio source, a DAB data source and a multimedia source;

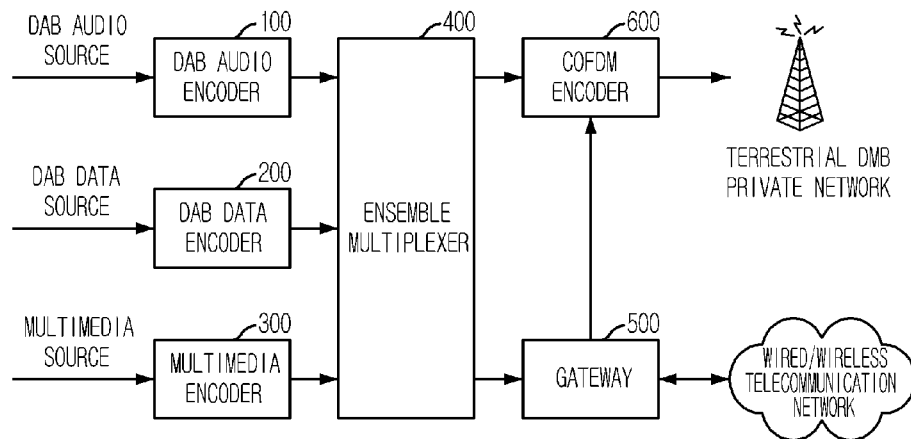
an ensemble multiplexing means for multiplexing the encoded DAB audio, the encoded DAB data and the encoded multimedia into a terrestrial DMB contents based on a ETI standard;

a gateway for transforming the terrestrial DMB contents into packets having a IP format to access IP networks or transporting the terrestrial DMB contents to a coded orthogonal frequency division multiplexing (COFDM) encoding means to access a terrestrial DMB private network; and

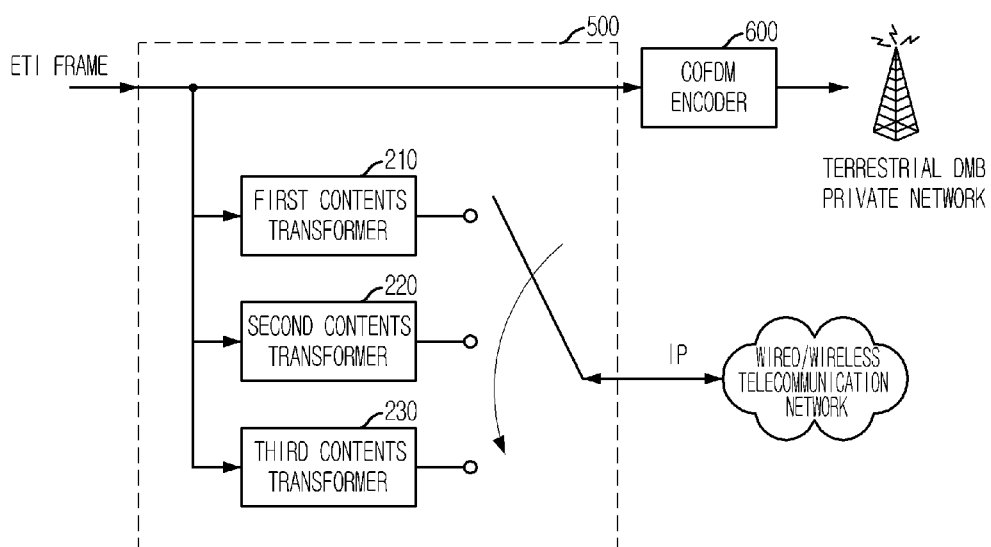
the COFDM encoding means for encoding the terrestrial DMB contents based on a COFDM and transmitting the encoded terrestrial DMB contents,

wherein the gateway demultiplexes the terrestrial DMB contents based on the ETI frame format into a FIC and a MSC, converts the FIC into a packet having the IP format based on a SDP and a TCP/IP, and converts the MSC into a packet having the IP format based on an RTP and a UDP/IP.

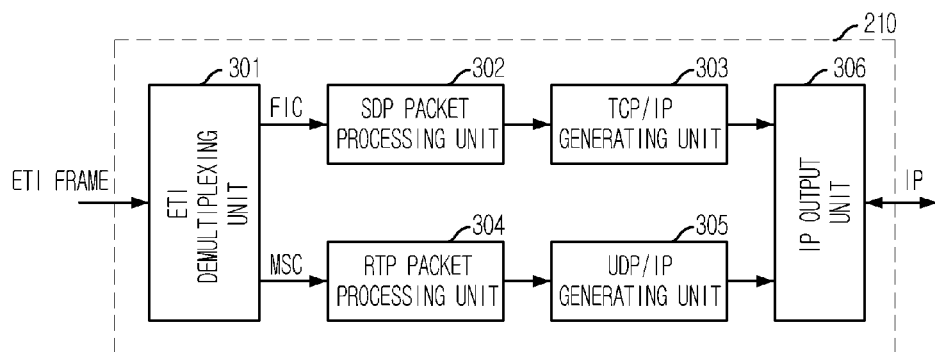
[Fig. 1]



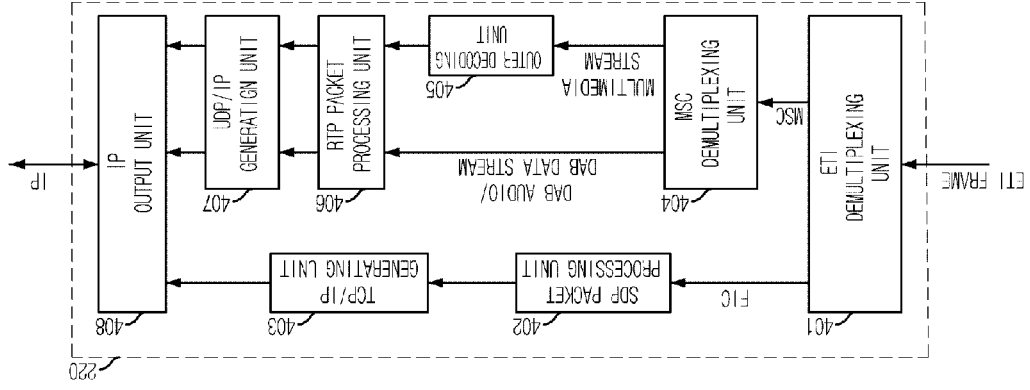
[Fig. 2]

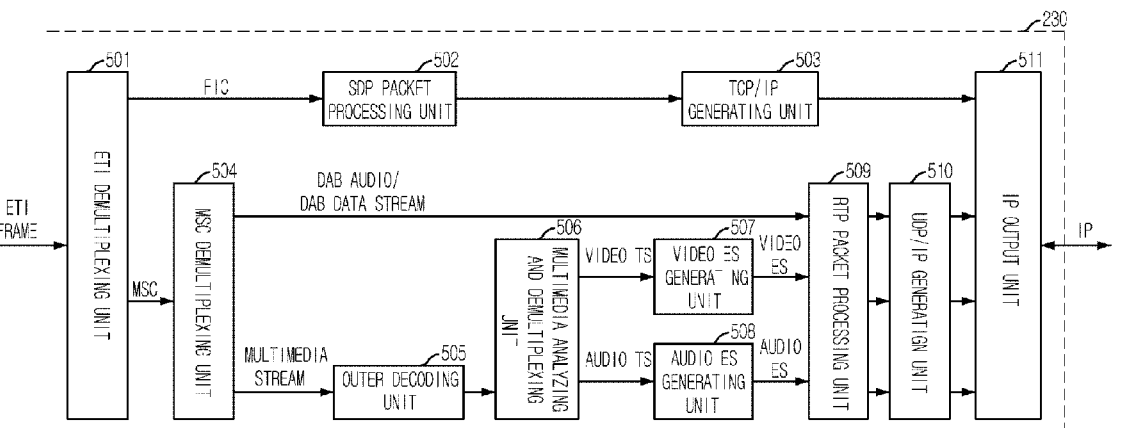


[Fig. 3]

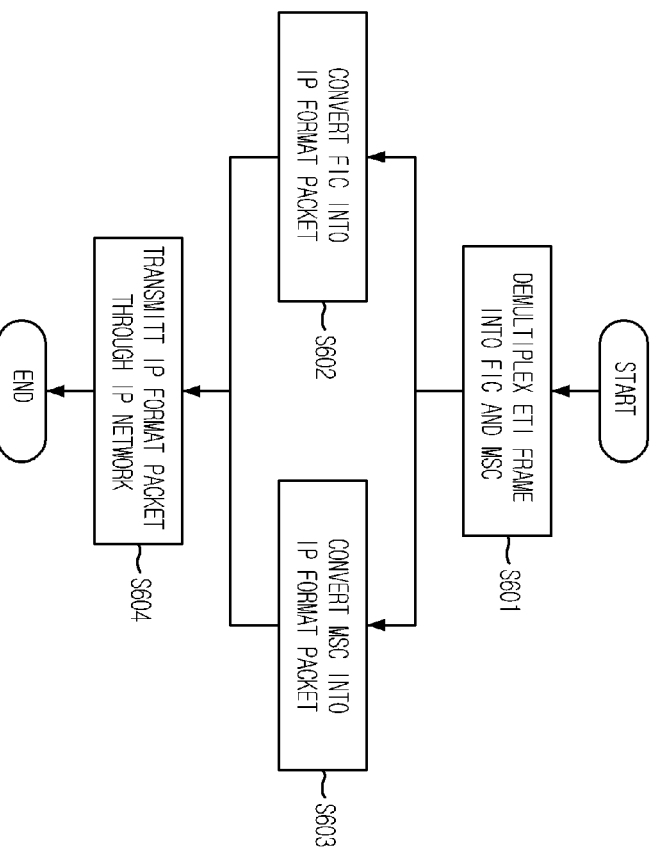


[Fig. 4]



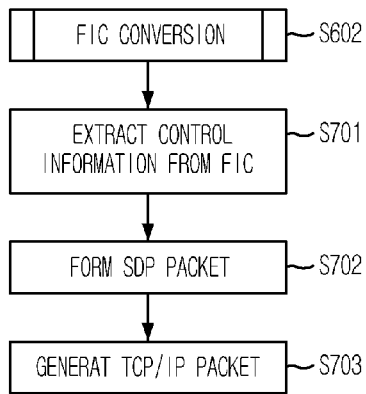


[Fig. 5]

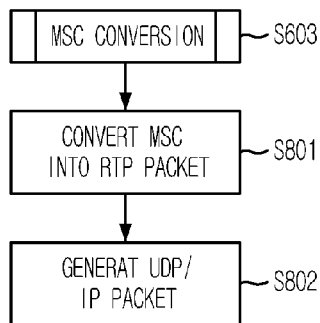


[Fig. 6]

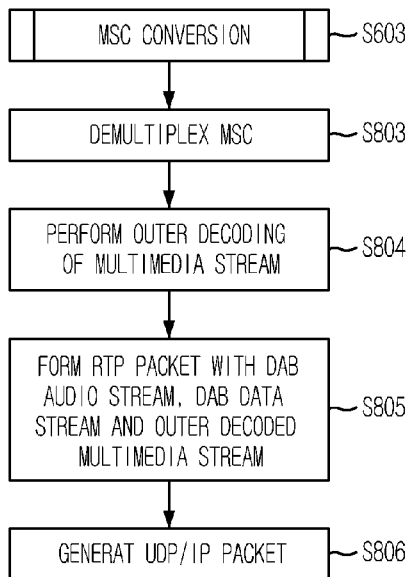
[Fig. 7]



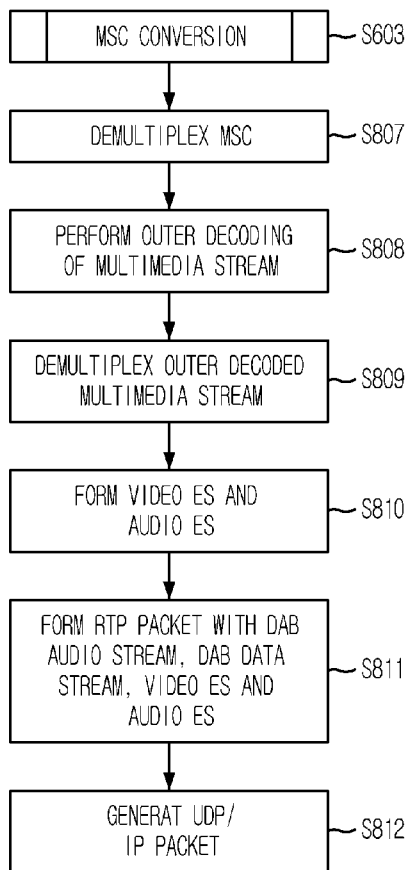
[Fig. 8]



[Fig. 9]



[Fig. 10]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2007/000494**A. CLASSIFICATION OF SUBJECT MATTER*****H04N 7/12(2006.01)i***

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 8 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility Models : IPC as aboveElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKIPASS(KIPO Internal): "DMB, ensemble, FIC, MSC"**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2006-001600 A1 (ELECTRONICS AND TELECOMMUNICATIONS RESEARCH INSTITUTE) 05 Jan. 2006 See abstract; claim 1; figure 2	1-11
A	WO 03-045064 A1 (NOKIA CORPORATION) 30 May 2003 See abstract; claim 1,16; figure 1	1-11
A	EP 1009114 A2 (ENSIGMA LIMITED) 14 June 2000 See abstract; claim 1; figure 3	1-11



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

02 MAY 2007 (02.05.2007)

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

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EP01009114A3	19.07.2000	None	