US 20100060714A1

(19) **United States**

(12) **Patent Application Publication**

Kang et al.

(10) **Pub. No.: US 2010/0060714 A1**

(43) **Pub. Date: Mar. 11, 2010**

(54) **DMB RECEIVING PORTABLE TERMINAL FOR HUMAN BODY COMMUNICATION, DMB TRANSMITTING METHOD THEREOF, AND HMD APPARATUS AND METHOD FOR DMB RECEPTION USING HUMAN BODY COMMUNICATION**

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(21) Appl. No.: **12/515,535**

(22) PCT Filed: **Oct. 31, 2007**

(86) PCT No.: **PCT/KR07/05435**

§ 371 (c)(1),
(2), (4) Date: **May 19, 2009**

(30) **Foreign Application Priority Data**

Nov. 20, 2006 (KR) 10-2006-0114664
Dec. 6, 2006 (KR) 10-2006-0123350

Publication Classification

(51) **Int. Cl.**
H04N 7/14 (2006.01)
G09G 5/00 (2006.01)
H04N 5/50 (2006.01)

(52) **U.S. Cl.** ... **348/14.02**; 345/8; 348/731; 348/E07.077; 348/E05.097

(57) **ABSTRACT**

Provided are a DMB receiving portable apparatus for human body communication, a DMB transmitting method thereof, and an HMD apparatus and method for DMB reception using human body communication. The digital multimedia broadcasting (DMB) receiving portable apparatus for human body communication includes: a DMB receiver adapted to perform DMB Rx signal processing on a DMB signal to convert the DMB signal into an audio/video signal, and transmit to a transmission electrode an intermediate frequency (IF) band broadcast signal or a transmission stream (TS) generated in the DMB Rx signal processing; and the transmission electrode adapted to apply the IF band broadcast signal or the TS to the human body as a DMB signal for human body communication.

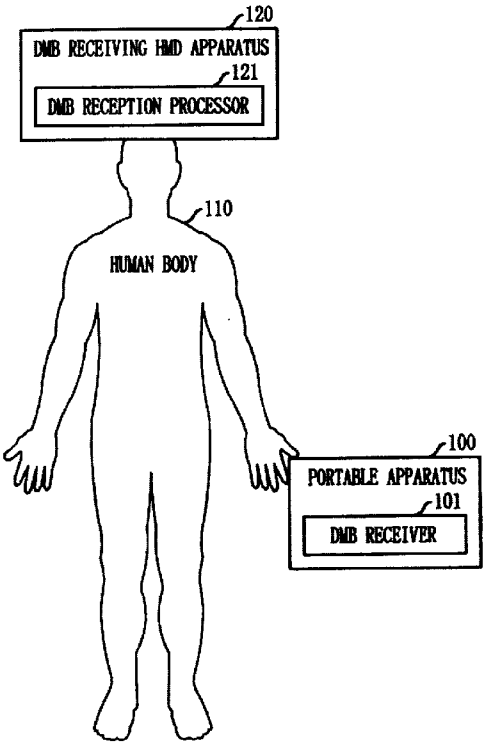


FIG. 1

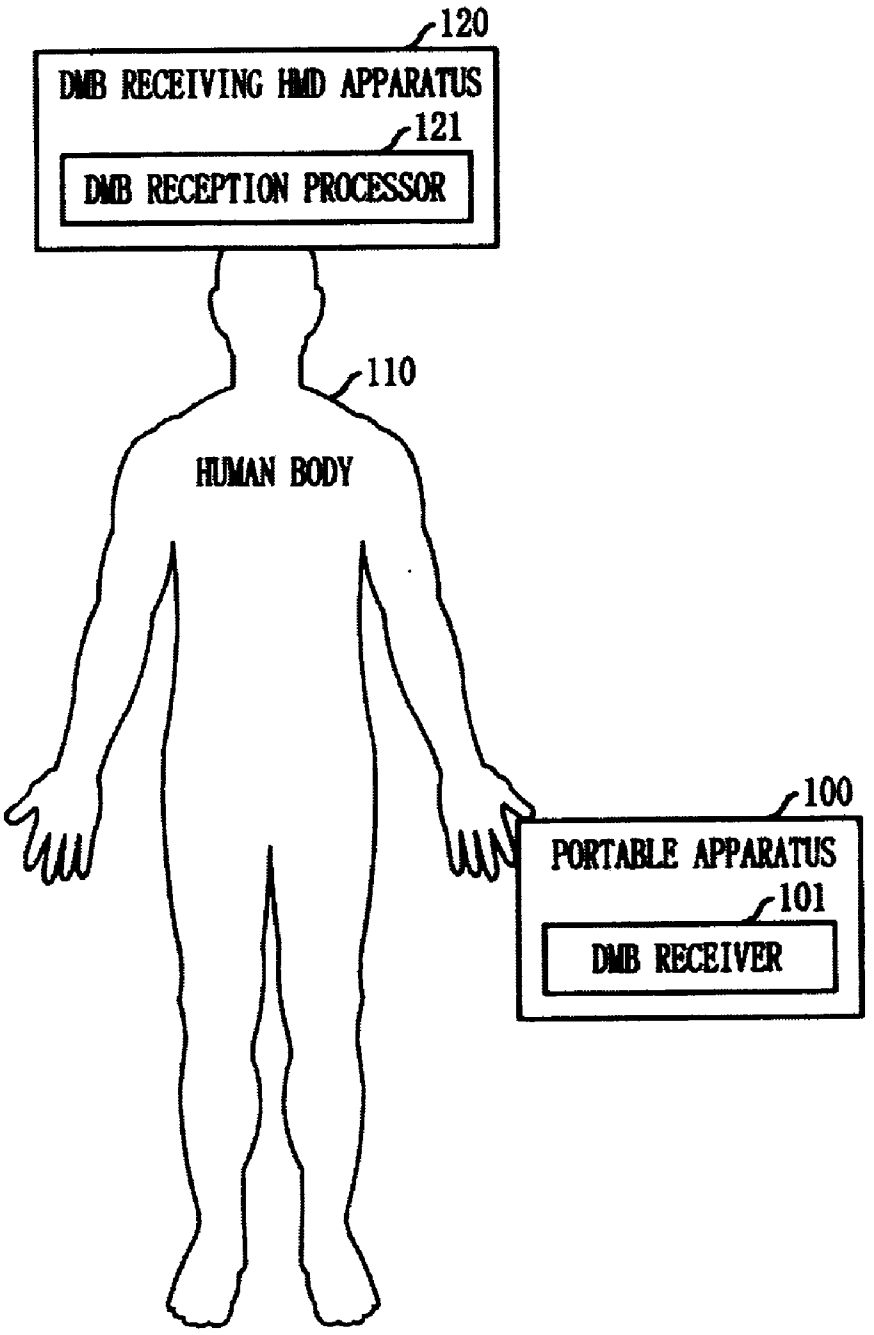

120
DMB RECEIVING HMD APPARATUS
121
DMB RECEPTION PROCESSOR
110
HUMAN BODY
100
PORTABLE APPARATUS
101
DMB RECEIVER

FIG. 2

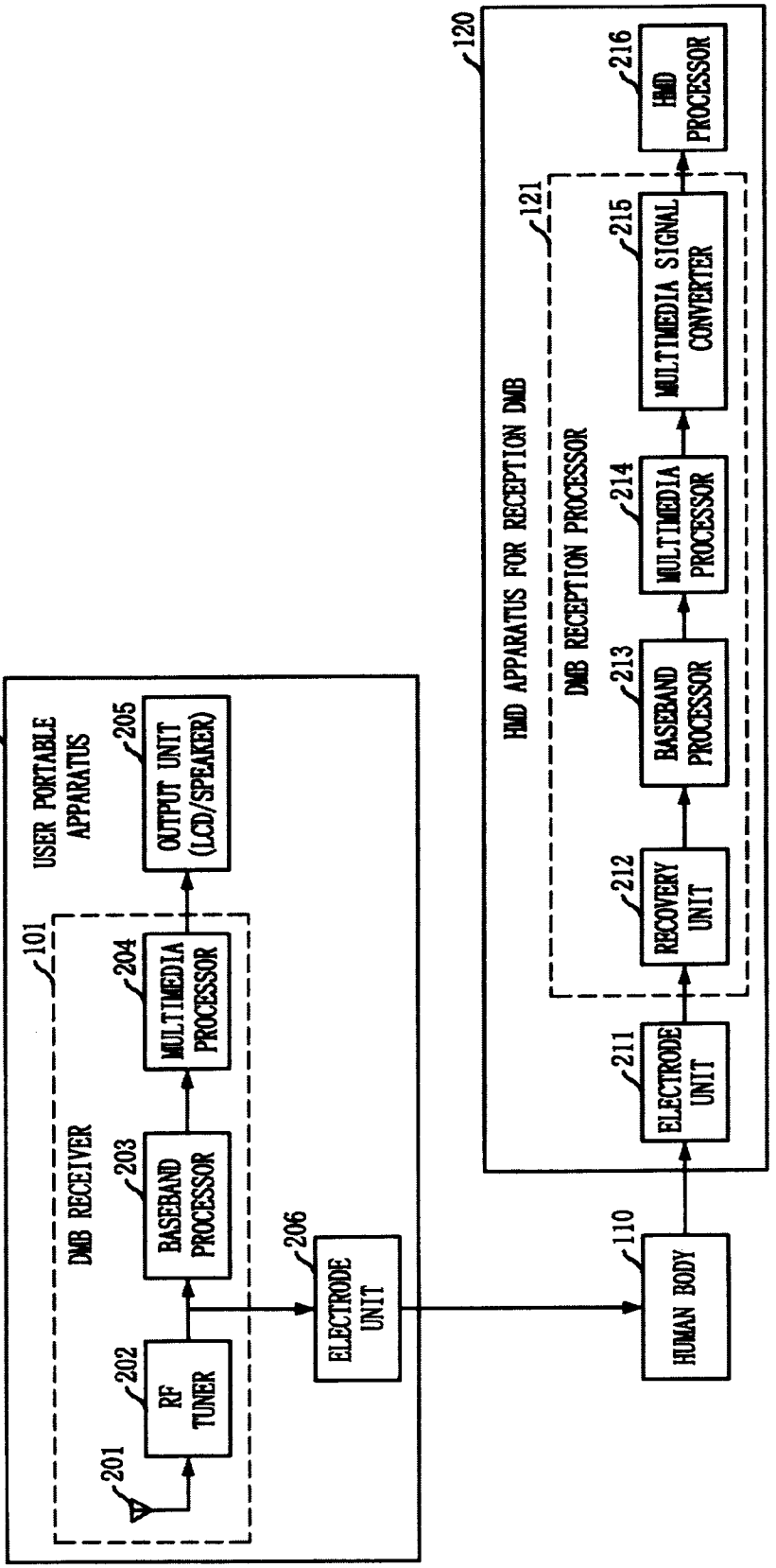
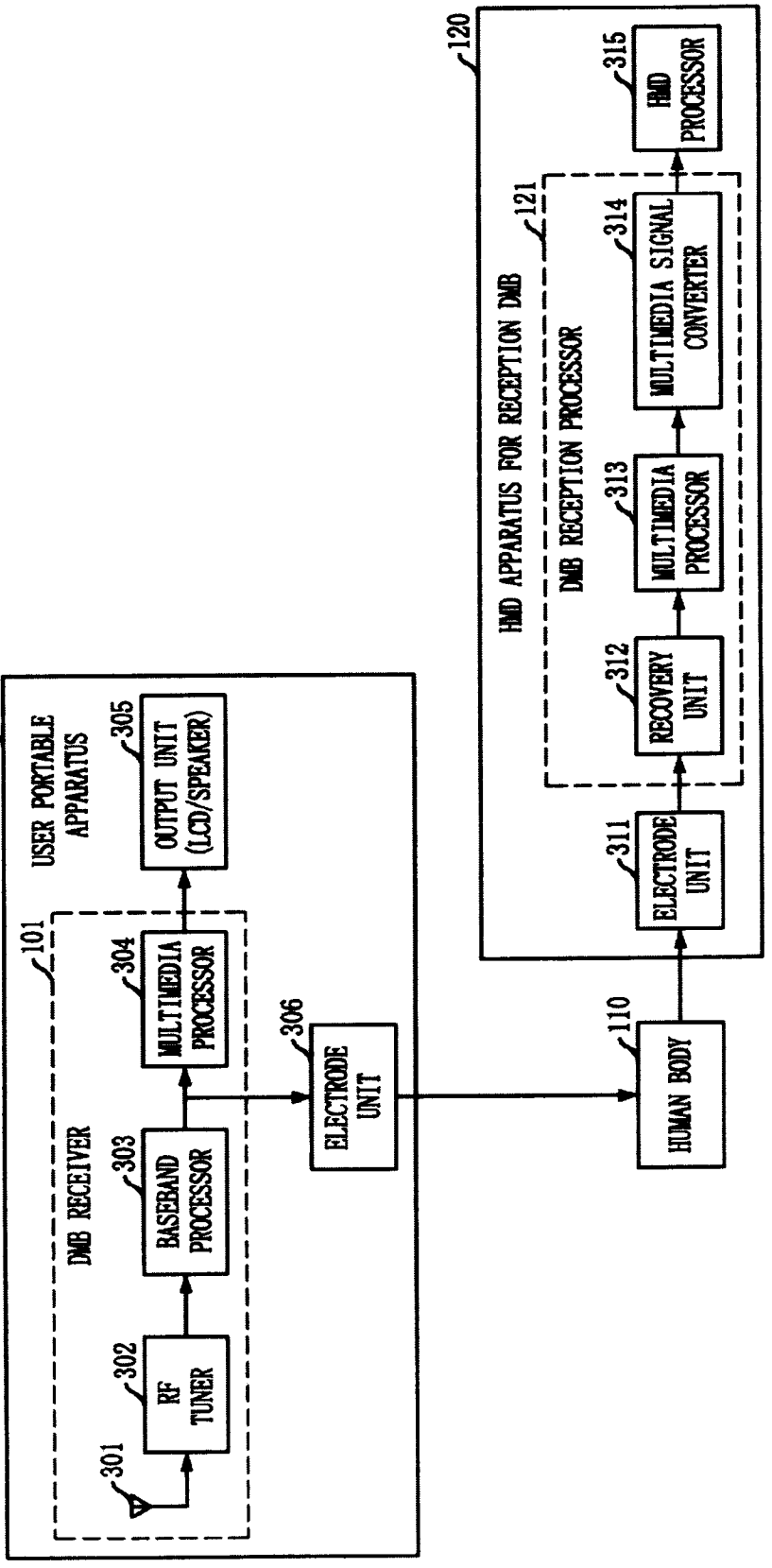

100
USER PORTABLE APPARATUS
101
DMB RECEIVER
201
202
RF TUNER
203
BASEBAND PROCESSOR
204
MULTIMEDIA PROCESSOR
205
OUTPUT UNIT (LCD/SPEAKER)
206
ELECTRODE UNIT
110
HUMAN BODY
120
HMD APPARATUS FOR RECEPTION DMB
121
DMB RECEPTION PROCESSOR
211
ELECTRODE UNIT
212
RECOVERY UNIT
213
BASEBAND PROCESSOR
214
MULTIMEDIA PROCESSOR
215
MULTIMEDIA SIGNAL CONVERTER
216
HMD PROCESSOR

FIG. 3


100
USER PORTABLE APPARATUS
101
DMB RECEIVER
301
302
RF TUNER
303
BASEBAND PROCESSOR
304
MULTIMEDIA PROCESSOR
305
OUTPUT UNIT (LCD/SPEAKER)
306
ELECTRODE UNIT
110
HUMAN BODY
120
HMD APPARATUS FOR RECEPTION DMB
121
DMB RECEPTION PROCESSOR
311
ELECTRODE UNIT
312
RECOVERY UNIT
313
MULTIMEDIA PROCESSOR
314
MULTIMEDIA SIGNAL CONVERTER
315
HMD PROCESSOR

DMB RECEIVING PORTABLE TERMINAL FOR HUMAN BODY COMMUNICATION, DMB TRANSMITTING METHOD THEREOF, AND HMD APPARATUS AND METHOD FOR DMB RECEPTION USING HUMAN BODY COMMUNICATION

TECHNICAL FIELD

[0001] The present invention relates to a digital multimedia broadcasting (DMB) receiving portable terminal for human body communication, a DMB transmitting method thereof, and a head mounted display (HMD) apparatus and method for DMB reception using human body communication; and, more particularly, to a DMB receiving portable apparatus for human body communication, which allow a user to conveniently receive DMB services via a user's body without cable or antenna, a DMB transmitting method thereof, and an HMD apparatus and method for DMB reception using human body communication. The DMB receiving portable apparatus connects the portable apparatus with the HMD apparatus by configuring the portable apparatus to send DMB data to the HMD apparatus via the user's body, and configuring the HMD apparatus to process the DMB data received via the user's body and display the DMB data.

[0002] This work was supported by the Information Technology (IT) research and development program of the Korean Ministry of Information and Communication (MIC) and/or the Korean Institute for Information Technology Advancement (IITA) [2006-S-072-01, "Controller SoC for Human Body Communications"].

BACKGROUND ART

[0003] Digital multimedia broadcasting (DMB) services are intended to provide a user who is moving in a car or is walking with a variety of multimedia services such as video and various data. The DMB may be categorized into terrestrial DMB and satellite DMB.

[0004] As for the terrestrial DMB, a very high frequency (VHF) band signal of approximately 200 MHz band is sent via a broadcasting base station currently being used for analog TV broadcasting, and the signal is received by each user via a user's receiver. There are a variety of types of receivers used for the terrestrial DMB service, such as car receivers, fixed receivers, and portable receiver. Among those receivers, demands are expected to explosively increase, for a portable DMB receiver that is a combination type receiver with a terrestrial DMB-dedicated receiver or a typical portable phone.

[0005] To transmit multimedia data of a portable DMB receiver to a head mount display (HMD) apparatus, a wired transmission medium or a wireless transmission medium may be used. If the wired transmission medium is used, users action is limited because of cable connection, which causes inconvenience in use. If the wireless transmission medium is used, an antenna for connecting the DMB receiver with the HMD apparatus is additionally required for the DMB receiver and the HMD apparatus, which deteriorates portability.

DISCLOSURE OF INVENTION

Technical Problem

[0006] An embodiment of the present invention is directed to providing a DMB receiving portable apparatus for human body communication, a DMB transmitting method thereof, an HMD apparatus and method for DMB reception using human body communication. The DMB receiving portable apparatus allows a user to conveniently receive DMB services via a user's body without a separate cable or antenna, which connect the portable apparatus with the HMD apparatus, by configuring the portable apparatus to send DMB data to the HMD apparatus via the user's body, and configuring the HMD apparatus to process the DMB data received via the user's body and display the DMB data.

[0007] Other objects and advantages of the present invention can be understood by the following description, and become apparent with reference to the embodiments of the present invention. Also, it is obvious to those skilled in the art of the present invention that the objects and advantages of the present invention can be realized by the means as claimed and combinations thereof.

Technical Solution

[0008] In accordance with an aspect of the present invention, there is provided a digital multimedia broadcasting (DMB) receiving portable apparatus for human body communication, which includes: a DMB receiver adapted to perform DMB Rx signal processing on a DMB signal to convert the DMB signal into an audio/video signal, and transmit to a transmission electrode an intermediate frequency (IF) band broadcast signal or a transmission stream (TS) generated in the DMB Rx signal processing; and the transmission electrode adapted to apply the IF band broadcast signal or the TS to the human body as a DMB signal for human body communication. The apparatus may further include an output unit adapted to output an audio/video signal converted at the DMB receiver.

[0009] In accordance with another aspect of the present invention, there is provided a head mount display device (HMD) for digital multimedia broadcasting (DMB) reception using human body communication, which includes: a reception electrode adapted to receive a DMB signal for human body communication transmitted via a user's body from a DMB receiving portable apparatus; a DMB reception processor adapted to convert the DMB signal for human communication into an audio/video signal through DMB Rx signal processing, and convert the audio/video signal into audio/video data based on an HMD standard; and an HMD processor adapted to reproduce the HMD audio/video data converted at the DMB reception processor.

[0010] In accordance with another aspect of the present invention, there is provided a method for transmitting a digital multimedia broadcasting (DMB) signal for human body communication, adapted for a portable apparatus having a DMB reception function, the method which includes the steps of: a) performing DMB Rx signal processing on a radio frequency (RF) band DMB signal received via an antenna to convert the RF band DMB signal into an audio/video signal; and b) applying an intermediate frequency (IF) band broadcast signal or a transmission stream (TS) generated in the DMB Rx signal processing to a user's body, and transmitting the IF band broadcast signal or the TS to a corresponding head mount display (HMD) apparatus.

[0011] In accordance with another aspect of the present invention, there is provided a method for digital multimedia broadcasting (DMB) reception, adapted for a head mount display (HMD) apparatus for DMB reception using human body communication, the method which includes the steps of:

a) performing DMB Rx signal processing on a DMB signal for human body communication transmitted from a DMB receiving portable apparatus via a user's body to convert the DMB signal for human body communication into an audio/video signal; b) converting the audio/video signal into audio/video data based on an HMD standard; and c) reproducing the audio/video HMD data.

ADVANTAGEOUS EFFECTS

[0012] In according with embodiments of the present invention, a user carrying a portable terrestrial-DMB receiver can view terrestrial DMB broadcasting through an HMD apparatus.

[0013] Because a user's body serves as a transmission channel, there is no need to use a separate cable or antenna for connecting the portable terrestrial DMB receiver with the HMD apparatus, and thus user's convenience is improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIG. **1** is a view for explaining a method for connecting an HMD apparatus for DMB reception with a user portable apparatus using a human body as a transmission channel in accordance with the present invention.

[0015] FIG. **2** is a block diagram of a DMB receiving portable apparatus for human body communication, and an HMD apparatus for DMB reception using human body communication in accordance with a first embodiment of the present invention.

[0016] FIG. **3** is a block diagram of a DMB receiving portable apparatus for human body communication, and an HMD apparatus for DMB reception using human body communication in accordance with a second embodiment of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0017] The advantages, features 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. Therefore, those skilled in the field of this art of the present invention can embody the technological concept and scope of the invention easily. In addition, if it is considered that detailed description on a related art may obscure the points of the present invention, the detailed description will not be provided herein. The preferred embodiments of the present invention will be described in detail hereinafter with reference to the attached drawings.

[0018] FIG. **1** is a view for explaining a method for connecting an HMD apparatus for DMB reception and a user portable apparatus by using a human body as a transmission channel in accordance with the present invention.

[0019] FIG. **1** shows a state in which a DMB receiving portable apparatus **100** (hereinafter, referred to as a user portable apparatus) including a terrestrial DMB receiver **101** is connected with an HMD apparatus **120** for DMB reception (hereinafter, referred to as an HMD apparatus) including a DMB reception processor **121** by using a human body **110** as a transmission channel.

[0020] In accordance with the present invention, when the user portable apparatus **100** including the terrestrial DMB receiver **101** transmits multimedia broadcast data via the human body **110**, the HMD apparatus **120** receives the multimedia broadcast data via the human body **110**, and performs DMB reception processing on the multimedia broadcast data, and displays the broadcast data through the HMD processor.

[0021] In accordance with the present invention, a user of the portable apparatus **100** including the terrestrial DMB receiver **101** can view portable terrestrial DMB broadcasting using the HMD apparatus **120**.

[0022] That is, in accordance with the present invention, the user's body **110** is used as a transmission channel, thereby removing a need for a separate cable or antenna for interconnection of the portable apparatus **100** and the HMD apparatus **120** for transmission of multimedia data.

[0023] Also, only the transmission medium is changed to the human body without changing the typical portable apparatus **100** including the terrestrial DMB receiver **101** and the typical HMD apparatus, which corresponds to an HMD processor **216** of FIG. **2**. For this reason, other functions of the typical portable apparatus **100** and the HMD processor **216** can be used in the same manner.

[0024] FIG. **2** is a block diagram of a DMB receiving portable apparatus for human body communication, and an HMD apparatus for DMB reception using human body communication in accordance with a first embodiment of the present invention.

[0025] First, the DMB receiving portable apparatus **100**, i.e., a user portable apparatus in accordance with the first embodiment of the present invention will now be described.

[0026] The user portable apparatus **100** in accordance with the first embodiment of the present invention includes a DMB receiver **101**, an output unit **205** such as a liquid crystal display (LCD) and a speaker, and an electrode unit **206**, which is a transmission electrode.

[0027] The DMB receiver **101** performs DMB Rx signal processing on a DMB signal transmitted over a broadcasting network to convert the DMB signal into an audio/video signal, and transmits an intermediate frequency (IF)-band broadcast signal generated in the DMB Rx signal processing to the electrode unit **206**, which is a transmission electrode. In detail, the DMB receiver **101** includes an antenna **201**, a radio frequency (RF) tuner **202**, a baseband processor **203**, and a multimedia processor **204**. The DMB receiver **101** of the user portable apparatus **100** receives and processes a broadcast signal from the outside in the same manner as a general DMB receiver.

[0028] The DMB signal received via the antenna **201** of the DMB receiver **101**, e.g., a terrestrial DMB receiver, and converted into an IF band signal by the RF tuner **202** is applied to the human body **101** through the electrode unit **206**, i.e., the transmission electrode. The DMB signal applied to the human body **110** is transmitted to the HMD apparatus **120** via the human body serving as a transmission channel.

[0029] The terrestrial DMB signal received via the antenna **201** of the DMB receiver **101** is converted into an IF band signal at the RF tuner **202**, and is transmitted to the human body **110** through the electrode unit **206**.

[0030] The electrode unit **206** contacts the human body **110**, and performs impedance matching between the output of the RF tuner **202** and the human body **110**. That is, the electrode unit **206**, i.e., the transmission electrode, applies an IF band broadcast signal, i.e., a DMB signal for human body communication, to the human body.

[0031] The HMD apparatus **120**, i.e., an HMD apparatus for DMB reception in accordance with the present invention will now be described.

[0032] As shown, the HMD apparatus **120** includes an electrode unit **211**, which is a reception electrode, a DMB reception processor **121**, and an HMD processor **216**.

[0033] The DMB reception processor **121** converts an IF band DMB signal, i.e., a DMB signal for human body communication, trough DMB Rx signal processing, and converts the audio/video signal to audio/video data according to an HMD standard. The DMB reception processor **121** includes a recovery unit **212**, a baseband processor **213**, a multimedia processor **214**, and a multimedia signal converter **215**.

[0034] A signal transmitted to the human body **110** is input to the recovery unit **212** of the DMB reception processor **121** via the electrode unit **211**. The electrode unit **211** contacts the human body **110** to perform impedance matching between the human body **110** and the DMB reception processor **121**.

[0035] The signal having passed through the human body **110** and the electrode unit **211** includes not only a transmission signal output to the electrode unit **211** but also noise and interference caused by the influence of an external electronic device, which may cause signal distortion. Therefore, the recovery unit **212** includes an amplifier, a filter, an analog to digital converter (ADC), or a clock data recovery (CDR) unit.

[0036] The data input to the baseband processor **213** is output as a byte stream based on an MPEG-2 TS standard, and is input to the multimedia processor **214**. A transmission stream (TS) input to the multimedia processor **214** is converted into an audio signal and a video signal, and is transmitted to the multimedia signal converter **215**.

[0037] The multimedia signal converter **215** converts the video signal output from the multimedia processor **214** into a video signal based on the HMD standard, and transmits the converted signal to the HMD processor **216**. Also, the multimedia signal converter **215** converts a digital audio signal output from the multimedia processor **214** into an analog audio signal, and transmits the converted audio signal to the HMD processor **216**. The video/audio signal input to the HMD processor **216** is reproduced through, for example, an LCD and a speaker.

[0038] FIG. **3** is a block diagram of a DMB receiving portable apparatus for human body communication, and an HMD apparatus for DMB reception using human body communication in accordance with a second embodiment of the present invention.

[0039] A user portable apparatus **100**, i.e., a DMB receiving portable apparatus for human body communication in accordance with the second embodiment of the present invention will now be described.

[0040] The user portable apparatus **100** in accordance with the second embodiment of the present invention includes a DMB receiver **101**, an output unit **305** such as an LCD and a speaker, and an electrode unit **306**, which is a transmission electrode.

[0041] The DMB receiver **101** performs DMB Rx signal processing on a DMB signal to convert the signal into an audio/video signal. Also, the DMB receiver **101** transmits a transmission stream (TS) generated in the DMB Rx signal processing to the electrode unit **306**. In detail, the DMB receiver **101** includes an antenna **301**, an RF tuner **302**, a baseband processor **303**, and a multimedia processor **304**. The user portable apparatus **100** shown in FIG. **3** is the same as the user portable apparatus **100** shown in FIG. **2**, except that a transmission stream (TS) output from the baseband processor **303** is transmitted via the human body.

[0042] Unlike the first embodiment of FIG. **2**, in the second embodiment of FIG. **3**, a transmission stream (TS) output from the baseband processor **303** of the DMB receiver **101** is transmitted to the HMD apparatus **120** via the human body **110**.

[0043] A terrestrial DMB signal input via the antenna **301** of the DMB receiver **101** is converted into an IF band signal at the RF tuner **302**, and is input to the baseband processor **303**. The baseband processor **303** converts the input signal into a byte stream based on the MPEG-2 standard, and then outputs the converted byte stream to the multimedia processor **313** and the electrode unit **306**.

[0044] The electrode unit **306** contacts the human body to perform impedance matching between the baseband processor **303** and the human body **110**, and thus sends the transmission stream (TS) output from the baseband processor **303** to the human body **110**. The transmission stream (TS) input to the human body **110** is transmitted to the HMD apparatus **120** through the electrode unit **311**.

[0045] The HMD apparatus **120**, i.e., an HMD apparatus for DMB reception in accordance with the second embodiment of the present invention will now be described.

[0046] As shown, the HMD apparatus **120** in accordance with the second embodiment of the present invention includes an electrode unit **311**, which is a reception electrode, a DMB reception processor **121**, and an HMD processor **315**.

[0047] The DMB reception processor **121** serves to convert a transmission stream (TS), i.e., a DMB signal for human communication, into an audio/video signal through DMB Rx signal processing, and to convert the audio/video signal into audio/video data based on the HMD standard. The DMB reception processor **121** includes a recovery unit **312**, a multimedia processor **313**, and a multimedia signal converter **314**.

[0048] The electrode unit **311** performs impedance matching between the DMB reception processor **121** and the human body **110**. The transmission stream (TS) input through the electrode unit **311** is transmitted to the recovery unit **312** for signal recovery.

[0049] The recovery unit **312** includes, for example, an amplifier, a filter, an ADC or a CDR unit in order to reduce signal distortion and recover a signal from noise or interference. The transmission stream (TS) transmitted to the multimedia processor **313** is converted into an audio/video signal, and is transmitted to the multimedia signal converter **314**.

[0050] The multimedia signal converter **314** converts the audio/video signal into an audio/video signal based on the HMD standard, and transmits the converted audio/video signal to the HMD processor **315**.

[0051] As described above, the technology of the present invention can be realized as a program and stored in a computer-readable recording medium, such as CD-ROM, RAM, ROM, floppy disk, hard disk and magneto-optical disk. Since the process can be easily implemented by those skilled in the art of the present invention, further description will not be provided herein.

[0052] The present application contains subject matter related to Korean Patent Application No. 10-2006-0114664 and 10-2006-0123350, filed in the Korean Intellectual Property Office on Nov. 20, 2006, and Dec. 6, 2006, the entire contents of which is incorporated herein by reference.

[0053] 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 modifica-

tions may be made without departing from the scope of the invention as defined in the following claims.

1. A digital multimedia broadcasting (DMB) receiving portable apparatus for human body communication, comprising:

a DMB receiver adapted to perform DMB Rx signal processing on a DMB signal to convert the DMB signal into an audio/video signal, and transmit to a transmission electrode an intermediate frequency (IF) band broadcast signal or a transmission stream (TS) generated in the DMB Rx signal processing; and

the transmission electrode adapted to apply the IF band broadcast signal or the TS to the human body as a DMB signal for human body communication.

2. The apparatus of claim **1**, further comprising an output unit adapted to output an audio/video signal converted at the DMB receiver.

3. The apparatus of claim **1**, wherein the DMB receiver comprises:

a radio frequency (RF) tuner adapted to convert an RF band DMB signal received via an antenna into an (IF) band DMB signal, and output the converted IF band DMB signal to a baseband processor and the transmission electrode;

the baseband processor adapted to convert the IF band DMB signal into a TS based on a DMB standard; and

a multimedia processor adapted to convert the TS into an audio/video signal.

4. The apparatus of claim **1**, wherein the DMB receiver comprises:

a radio frequency (RF) tuner adapted to convert an RF band DMB signal received via an antenna into an IF DMB signal;

a baseband processor adapted to convert the IF band DMB signal into TS based on a DMB standard, and output the TS to a multimedia processor and the transmission electrode; and

the multimedia processor adapted to convert the TS into an audio/video signal.

5. A head mount display device (HMD) for digital multimedia broadcasting (DMB) reception using human body communication, comprising:

a reception electrode adapted to receive a DMB signal for human body communication transmitted via a user's body from a DMB receiving portable apparatus;

a DMB reception processor adapted to convert the DMB signal for human communication into an audio/video signal through DMB Rx signal processing, and convert the audio/video signal into audio/video data based on an HMD standard; and

an HMD processor adapted to reproduce the HMD audio/video data converted at the DMB reception processor.

6. The apparatus of claim **5**, wherein the DMB reception processor comprises:

a baseband processor adapted to convert the DMB signal for human body communication received through the reception electrode into a transmission stream (TS) based on a DMB standard, the DMB signal for human body communication being an intermediate frequency (IF) band DMB signal;

a multimedia processor adapted to convert the TS into an audio/video signal; and

a signal converter adapted to convert the audio/video signal into audio/video data based on an HMD standard.

7. The apparatus of claim **5**, wherein the DMB reception processor comprises:

a multimedia processor adapted to convert the DMB signal for human body communication transmitted through the reception electrode into an audio/video signal, the DMB signal for human body communication being a transmission stream (TS); and

a signal converter adapted to convert the audio/video signal into audio/video data according to an HMD standard.

8. The apparatus of claim **6**, further comprising a recovery unit adapted to correct signal distortion of the DMB signal for human body communication received through the reception electrode.

9. A method for transmitting a digital multimedia broadcasting (DMB) signal for human body communication, adapted for a portable apparatus having a DMB reception function, comprising the steps of:

a) performing DMB Rx signal processing on a radio frequency (RF) band DMB signal received via an antenna to convert the RF band DMB signal into an audio/video signal; and

b) applying an intermediate frequency (IF) band broadcast signal or a transmission stream (TS) generated in the DMB Rx signal processing to a user's body, and transmitting the IF band broadcast signal or the TS to a corresponding head mount display (HMD) apparatus.

10. The method of claim **9**, wherein the step a) includes the steps of:

a1) converting the RF band DMB signal into an IF band DMB signal;

a2) converting the IF band DMB signal into a TS based on a DMB standard; and

a3) converting the TS into an audio/video signal.

11. A method for digital multimedia broadcasting (DMB) reception, adapted for a head mount display (HMD) apparatus for DMB reception using human body communication, comprising the steps of:

a) performing DMB Rx signal processing on a DMB signal for human body communication transmitted from a DMB receiving portable apparatus via a user's body to convert the DMB signal for human body communication into an audio/video signal;

b) converting the audio/video signal into audio/video data based on an HMD standard; and

c) reproducing the audio/video HMD data.

12. The method of claim **11**, wherein the step a) includes the steps of:

a1) converting an intermediate frequency (IF) band DMB signal for human body communication received through a reception electrode into a transmission stream (TS) based on a DMB standard;

a2) converting the TS into an audio/video signal; and

a3) converting the audio/video signal into audio/video data based on an HMD standard.

13. The method of claim **11**, wherein the step of a) includes the steps of:

a1) converting a transmission stream (TS) for human body communication transmitted through a reception electrode into an audio/video signal; and

a2) converting the audio/video signal into audio/video data based on an HMD standard.

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