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(71) Applicant: 000000295

Oki Electric Industry Co., Ltd.3-16-11 Nishi-Shinbashi, Minato-Ku,
Tokyo

(74) Agent: 100090620

Nobuyuki Kudo, Patent Attorney(72) Inventor: **Takaaki Hatanaka**

c/o: Oki Electric Industry Co., Ltd.

3-16-11 Nishi-Shinbashi, Minato-ku,
Tokyo

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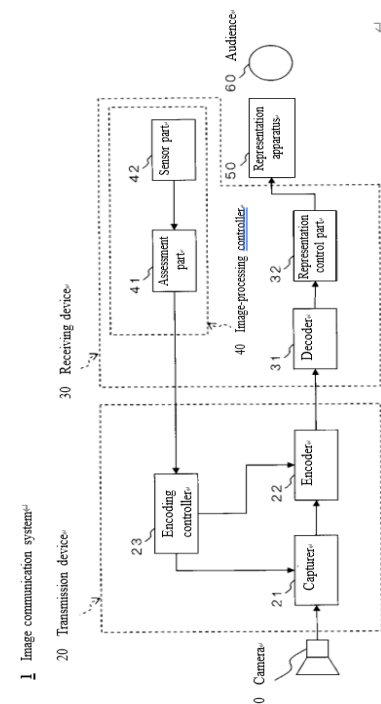
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(54) TITLE OF THE INVENTION: Image Communication System, as well as Image-Processing Control Device and Method**(57) ABSTRACT**

OBJECTIVE: To reduce the throughput of image-data-related processing in an image communication system configured to encode images on the transmitting side and then decode the encoded data on the receiving side to output the representation of the images.

MEANS FOR ACHIEVING THE OBJECTIVE: The present invention pertains to an image communication system provided with an encoding means for encoding an image and creating encoded image data, a decoding means for decoding the encoded image data, and a representation output part that outputs the representation of the decoded image to viewers. Additionally, the image communication system is characterized by comprising a viewer detection means for performing detections about the relative position between the above-mentioned representation output part and a viewer(s) and an encoding-content setting means for setting the content of the encoding by the above-mentioned encoding means according to the result detected by the above-mentioned means that measures the distance of a viewer(s).

SELECTED DRAWING: Figure 1



WHAT IS CLAIMED IS:**CLAIM 1**

An image communication system, which is provided with an encoding means for encoding an image to create the encoded image data, a decoding means for decoding the encoded image data, and a representation output part which outputs the representation of the decoded image to viewers; said image communication system comprising:

A viewer detection means for performing detections about the relative position between said representation output part and a viewer(s), and

An encoding-content setting means for setting the content of the encoding performed by said encoding means according to the result detected by said viewer detection means.

CLAIM 2

The image communication system according to Claim 1, wherein:

Said viewer detection means detects at least a viewer distance from said representation output part to the viewer; and

Said encoding-content setting means sets the content of the encoding performed by said encoding means according to at least the viewer distance detected by said viewer detection means.

CLAIM 3

The image communication system according to Claim 2, wherein said encoding-content setting means sets the content of the encoding performed by said encoding means so as to reduce the amount of encoding-related throughput as the viewer distance detected by said viewer detection method increases.

CLAIM 4

The image communication system according to any of claims 1 to 3, wherein

Said viewer detection means detects at least a viewer direction in which said viewer is located in relation to said representation output part; and

Said encoding-content setting means sets the content of the encoding performed by said encoding means according to at least the viewer direction detected by said viewer detection means.

CLAIM 5

An image-processing control device, which controls the content of image-related processing in an image communication system that is provided with an encoding means for encoding an image to create the encoded image data, a decoding means for decoding the encoded image data, and a representation output part which outputs the representation of the decoded image to viewers; said image-processing control device comprising:

A viewer detection means for performing detections about the relative position between said representation output part and a viewer(s), and

An encoding-content setting means for setting the content of the encoding performed by said encoding means according to the result detected by said viewer detection means.

CLAIM 6

An image-processing control method used to control the content of image-related processing in an image communication system provided with an encoding means for encoding an image to create the encoded image data, a decoding means for decoding the encoded image data, and a representation output part which outputs the representation of the decoded image to viewers; said image-processing control method comprising:

A view detection means and an encoding-content setting means, wherein:

Said viewer detection means performs detections about the relative position between said representation output part and a viewer(s); and

Said encoding-content setting means sets the content of the encoding performed by said encoding means according to the result detected by said viewer detection means.

DETAILED DESCRIPTION OF THE INVENTION

TECHNOLOGICAL FIELD

[0001]

This invention pertains to an image communication system as well as an image-processing control device and method. For example, they can be applied to systems that distribute live video images.

BACKGROUND ART

[0002]

Conventionally, the devices described in patent documents 1 and 2 have been used to encode images, such as live video images.

[0003]

The device described in Patent Document 1 can dynamically alter the encoding resolution according to the amount of movement in the video image.

[0004]

The device described in Patent Document 2 includes a conventional system that uses the distance and positional relationship between the audience and the representation apparatus. The distance between the audience and the representation apparatus is used for the execution of the processing performed to make the identification of images projected on the representation apparatus difficult.

PRIOR ART DOCUMENTS

[Patent Documents]

[0005]

[Patent Document 1] JP, H07-95566, A

[Patent Document 2] JP, 2006-140747, A

SUMMARY OF THE INVENTION

PROBLEMS TO BE RESOLVED BY THE INVENTION

[0006]

However, the device described in Patent Document 1 poses a problem because merely lowering the encoding resolution without taking into account the distance between the audience and the representation apparatus does not resolve the issue that the encoding is performed at the same resolution regardless of whether the audience looks at the representation apparatus

from a distance or at close range, meaning that the processing load on the encoder remains higher than necessary.

[0007]

With the device described in Patent Document 2, the processing load on the encoder also remains higher than necessary because said device uses the distance between the audience and the representation apparatus as a criterion for the processing performed to make the identification of images projected on a representation apparatus difficult, although such processing with a conventional technology allows for communications with less psychological burdens.

[0008]

Consequently, there have been demands for ways to reduce the throughput of image-data-related processing in image communication systems that are configured to encode images on the transmitting side and then -- on the receiving side -- decode the encoded images for display.

MEANS FOR RESOLVING THE PROBLEMS

[0009]

The image communication system according to the first invention of the present application is an image communication system provided with (1) an encoding means for encoding an image to create the encoded image data, a decoding means for decoding the encoded image data, and a representation output part which outputs the representation of the decoded image to viewers; said image communication system characterized by comprising (2) a viewer detection means for performing detections about the relative position between the above-mentioned representation output part and a viewer(s), and (3) an encoding-content setting means for setting the content of the encoding performed by the above-mentioned encoding means according to the result detected by the above-mentioned viewer detection means.

[0010]

The image-processing control device according to the second invention of the present application is an image-processing control device that controls the content of image-related processing in an image communication system provided with (1) an encoding means for encoding an image to create the encoded image data, a decoding means for decoding the encoded image data, and a representation output part which outputs the representation of the decoded image to viewers; said image-processing control device characterized by comprising (2) a viewer detection means for performing detections about the relative position between the above-mentioned representation output part and a viewer(s), and (3) an encoding-content setting means for setting the content of the encoding performed by the above-mentioned encoding means according to the result detected by the above-mentioned viewer detection means.

[0011]

The image-processing control method according to the second invention of the present application is an image-processing control method used to control the content of image-related processing in an image communication system provided with (1) an encoding means for encoding an image to create the encoded image data, a decoding means for decoding the encoded image data, and a representation output part which outputs the representation of the decoded image to viewers; said image-processing control method characterized by comprising (2) a viewer detection means and an encoding-content setting means, wherein:

- (3) The above-mentioned viewer detection means performs detections about the relative position between the above-mentioned representation output part and a viewer; and
- (4) The above-mentioned encoding-content setting means sets the content of the encoding performed by the above-mentioned encoding means, doing so according to the result detected by the above-mentioned viewer detection means.

EFFECTS OF THE INVENTION

[0012]

The present inventions make it possible to reduce the throughput of image-data-related processing in an image communication system configured to encode images on the transmitting side and then decode the encoded data on the receiving side to output the representation of the images.

BRIEF EXPLANATION OF THE DRAWINGS

[0013]

Figure 1 shows a block diagram that illustrates the overall configuration of the image communication system and image-processing control device claimed in the first embodiment.

Figure 2 shows an illustrative drawing that explains the viewing distance according to the image-processing control device claimed in the first embodiment.

Figure 3 shows a flowchart that illustrates the operation of the image-processing control device claimed in the first embodiment.

Figure 4 shows a block diagram that illustrates the overall configuration of the image communication system and image-processing control device claimed in the second embodiment.

Figure 5 shows an illustrative drawing that explains the viewing distance and viewing angle according to the image-processing control device claimed in the second embodiment.

Figure 6 shows a flowchart that illustrates the operation of the image-processing control device claimed in the second embodiment.

EMBODIMENT OF THE INVENTION

[0014]

(A) The First Embodiment

The following is a detailed explanation of the first embodiment of the image communication system and the image-processing control device and method according to the present invention, with reference to the drawings:

[0015]

(A-1) Configuration of the First Embodiment

Figure 1 shows a block diagram that illustrates the overall configuration of image communication system 1 and image-processing control device 40 according to the present embodiment.

[0016]

Image communication system 1 has camera 10, transmission device 20, receiving device 30, and representation apparatus 50. Transmission device 20 has capturer 21, encoder 22, and encoding controller 23. Receiving device 30 has decoder 31, representation control part 32, and image-processing control device 40.

[0017]

In Figure 1, image-processing control device 40 is illustrated as having at least sensor 41 and assessment part 42. However, encoding controller 23 may be installed on the image-processing-control-device-40 side. In Figure 1, image-processing control device 40 is shown as being installed on the receiving-device-30 side, but it may be constructed as an independent discrete device.

[0018]

Camera 10 captures video images and provides signals representing the captured video images to transmission device 20. Camera 10 may be a conventional CCD camera or video camera. There is no restriction on the type of the camera. It should be noted that while images captured by camera 10 may be video or still images, video images are used in the first embodiment to illustrate images captured by camera 10.

[0019]

Transmission device 20 encodes video image signals provided by camera 10 and provides the encoded video image data to receiving device 30. Communication between transmission device 20 and receiving device 30 may be achieved via a network such as the Internet or a public

telephone network, or it may be achieved through a direct connection. There is no restriction on the method of communication.

[0020]

Receiving device 30 — upon receipt of encoded video-image data from transmission device 20 — decodes the data and outputs a video image signal to representation apparatus 50.

[0021]

Representation apparatus 50 outputs the representation of the video image to the audience (which may be hereinafter referred to as the "viewer") 60 according to the video image signals provided by receiving device 30. Representation apparatus 50 may be a conventional display device or any other device that can display information on a screen. There is no restriction on the type of the representation apparatus. It should be noted that, though not illustrated in Figure 1, the transmission-device-20 side may be configured so as to use a microphone to acquire audio as camera 10 captures video images as well as to encode the audio thus acquired and transmit it to the receiving-device-30 side so that the audio and the video image are output together to audience 60.

[0022]

The following is an explanation of the internal configuration of transmission device 20: Transmission device 20 has capturer 21, encoder 22, and encoding controller 23.

[0023]

Capturer 21 and encoder 22 in transmission device 20 are responsible for uploading and encoding the video image signals output from camera 10. If video image signals provided by camera 10 are analog signals, capturer 21 converts them to digital signals. However, if video image signals provided by camera 10 are digital signals, capturer 21 handles the signals in the as-is state. Then, capturer 21 gives the video image data to encoder 22. The video image data are then encoded by encoder 22 (which may use, for example, a conventional encoding scheme such as MPEG4) and are sent to receiving device 30. While transmission device 20 is equipped with capturer 21 in Figure 1, capturer 21 may be omitted if camera 10 provides video image data in the digital format or if a camera equipped with a capturer is used.

[0024]

Encoding controller 23 is responsible for controlling the content of the video-image encoding process performed by capturer 21 and encoding controller 22 in response to the control communicated from receiving device 30 (i.e., assessment part 42, which shall be described in a later section). The detailed description of the control provided by encoding controller 23 shall be described in a later section.

[0025]

Next is an explanation of the internal configuration of receiving device 30. Receiving device 30 has decoder 31, representation control part 32, and image-processing control device 40.

[0026]

Decoder 31 decodes the encoded image data provided by transmission device 20 and provides the decoded image data to representation control part 32. Decoder 31 applicable herein may be, for example, a conventional device that can decode video images.

[0027]

Representation control part 32 converts the image data decoded by decoder 31 into an image signal of the size that can be displayed on representation apparatus 50 and then provides the image signal of said display size to representation apparatus 50. Representation control part 32 may be installed on the representation apparatus-50 side. Representation control part 32 applicable herein may be any means for converting image data to be displayed into a signal of an image of the size that can be displayed on a display used to output the representation of said image according to the resolution of the image data, doing so in a conventional display device or computer, for example.

[0028]

The following is an explanation of the configuration of image-processing control device 40. Image-processing control device 40 has sensor 41 and assessment part 42.

[0029]

Sensor 41 measures the distance between audience 60 and representation apparatus 50 (hereinafter referred to as "viewing distance D") and provides assessment part 42 with the measurement result. Incidentally, sensor 41 may be placed around representation apparatus 50 so as to measure the distance between representation apparatus 50 and audience 60 and deem the distance thus measured as viewing distance D.

[0030]

Figure 2 shows an example of viewing distance D, i.e., the distance between representation apparatus 50 and audience 60.

[0031]

Figure 2 (a) shows an example of representation apparatus 50 (a display device in this example) in the state in which representation apparatus 50 (a display device) is viewed from the front.

[0032]

Figure 2 (b) shows an illustrative drawing that illustrates an example of viewing distance D, i.e., the distance between representation apparatus 50 and audience 60, in the state in which representation apparatus 50 shown in Figure 2 (a) is viewed from the top. In Figure 2 (b), viewing distance D is illustrated as the distance from the center of representation apparatus 50 to audience 60; however, it may be the distance from another section of representation apparatus 50 to audience 60.

[0033]

An example of the method used to measure viewing distance D in sensor 41 may involve the use of, for example, a motion sensor, a wireless IC tag, or the like as described in relation to the “proximity detection means” according to Patent Document 2.

[0034]

Another example of the method used to measure viewing distance D in sensor 41 may involve having audience 60 hold a wireless communication terminal (which, for example, may be built into a terminal used to operate representation apparatus 50, etc., such as a remote control terminal, a mobile phone terminal, or the like) and installing sensor 41 around representation apparatus 50 so that sensor 41 communicates with the above-described wireless communication terminal to thereby measure the distance between the above-described wireless communication terminal and sensor 41, i.e., viewing distance D. The above-described distance between the wireless communication terminal and sensor 41 may be measured based, for example, on the intensity of the signal received or the transmission lag time. Wireless communication between the above-described wireless communication terminal and sensor 41 may be achieved through the use of light, such as radio waves or infrared rays. However, there is no restriction on the communication method insofar as viewing distance D can be measured.

[0035]

Yet another example of the method used to measure viewing distance D in sensor 41 may involve installing multiple motion sensors around representation apparatus 50 and pre-registering the respective viewing distance for each motion sensor so as to recognize the distance of the audience based on which motion sensor has detected the audience. For example, motion sensors may be placed at equal distances from representation apparatus 50 to measure audience distance L. Incidentally, conventional motion sensors can be used as the motion sensors adopted for sensor 41.

[0036]

However, there is no restriction on the method used in sensor 41 insofar as viewing distance D can be measured.

[0037]

Assessment part 42 provides instructions to encoding controller 23 so as to control the content to be encoded according to viewing distance D measured by sensor 41. Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 adjusts the content to be encoded in such a way as to reduce the amount of encoding throughput and the amount of post-encoding data as viewing distance D increases. Additionally, assessment part 42 may be configured to adjust the content to be encoded in such a way as to minimize the amount of encoding throughput and the amount of post-encoding data when sensor 41 does not detect any audience 60.

[0038]

For example, suppose video image signals provided by camera 10 are analog signals (e.g., NTSC signals or the like). In this case, when the signal is uploaded to capturer 21 and converted to a digital image at a prescribed resolution, the resolution used in this event may be altered in response to the control provided by encoding controller 23. For example, a resolution in compliance with the instructions from encoding controller 23 may be used for the encoding rendered by encoder 22.

[0039]

Assessment part 42 can also be configured in other ways. For example, it may be configured so as to provide encoding controller 23 with instructions so that encoding controller 23 adjusts the frame rate, quantization step size, compression ratio, etc., according to viewing distance D. It should be noted that there are no restrictions on the method used to adjust the resolution, frame rate, etc., according to viewing distance D. The adjustment may be achieved by means of altering the parameters applied to the codec or changing the codec itself. By way of example, in the present embodiment, it is assumed that assessment part 42 and encoding controller 23 control the resolution of the image encoded by capturer 21 and encoder 22 in such a way that the resolution is lowered as viewing distance D increases.

[0040]

(A-2) Operation of the First Embodiment

The following is an explanation of the image-processing control operation (image-processing control method according to the embodiment) in image communication system 1, having the configuration described above according to the first embodiment.

[0041]

Figure 3 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system.

[0042]

In Figure 3, it is assumed that the video image data encoded by transmission device 20 is given to receiving device 30 and output from receiving device 30 to representation apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing.

[0043]

First, sensor 41 measures viewing distance D (S101).

[0044]

Next, upon receipt of viewing distance D from sensor 41, assessment part 42 sends out a signal, which controls the content to be encoded according to viewing distance D, to transmission device 20 (encoding controller 23) (S102).

[0045]

Upon receipt of the decoding-content control signal from assessment part 42, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and then capturer 21 and encoder 22 continue to encode video images according to that content (S103).

[0046]

In step S103, encoding controller 23 may be configured so as to not send a resolution-change instruction to capturer 21 and encoder 22 if it receives the same encoding resolution as the last encoding resolution used. Or, if encoding controller 23 receives a different encoding resolution from the last encoding resolution used, it may send a new encoding resolution to capturer 21 and encoder 22.

[0047]

Incidentally, the operation in steps S101 through S103 described above may be repeated continuously or periodically, or according to sensor 41's detection of audience 60's movement. There is no restriction on the timing of executing the process.

[0048]

(A-3) Effects of the First Embodiment

The first embodiment demonstrates the following effects:

[0049]

In capturer 21 and encoder 22, video image data are encoded at the resolution determined by assessment part 42 based on viewing distance D measured by sensor 41. Then, the video image data thus encoded are decoded by decoder 31 and displayed on representation apparatus 50. In this event, the resolution of the video image can be lowered to the extent that the audience cannot recognize the image, thus reducing the amount of encoding throughput. Additionally, the reduction of the amount of post-encoding data makes it possible to reduce the amount of data transmitted from transmission device 20 (encoder 22) to receiving device 30 (decoder 31), thereby reducing the load on the network.

[0050]

Additionally, data encoded at a reduced encoding resolution by encoder 22 is decoded by decoder 31. This makes it possible to reduce the amount of decoding throughput in decoder 31.

[0051]

For example, in a company having multiple offices, image communication system 1 is preferably adopted in a system that transmits live video images between multiple locations, for example, to distribute images of each office's sceneries as captured with a camera to other offices or distribute images of rivers, bays, etc., as captured with surveillance cameras to a monitoring center. In such a system that transmits live video images between multiple locations, the audience is not always near the representation apparatus (display) while the system is in operation. However, the present embodiment allows for the encoding/decoding at a lower

resolution, etc., when there is no audience in the immediate vicinity of the representation apparatus (display), thus enabling efficient processing of images.

[0052]

(B) The Second Embodiment

The following is a detailed explanation of the second embodiment of the image communication system and the image-processing control device and method according to the present invention with reference to the drawings:

[0053]

(B-1) Configuration of the Second Embodiment

In the first embodiment, sensor 41 measures viewing distance D only, and assessment part 42 uses only viewing distance D for processing. However, in the second embodiment, not only viewing distance D but also the direction in which audience 60 is located relative to representation apparatus 50 is included as an element used to determine the encoding content.

[0054]

Figure 4 shows a block diagram that illustrates the overall configuration of image communication system 1A and image-processing control device 40A according to the present embodiment.

[0055]

Image communication system 1A has camera 10, transmission device 20, receiving device 30, and representation apparatus 50. Camera 10, transmission device 20, and representation apparatus 50 are similar to those illustrated in the first embodiment. Accordingly, the explanation thereof shall be omitted hereafter.

[0056]

Receiving device 30A has decoder 31, representation control part 32, and image-processing control device 40A. Decoder 31 and representation control part 32 are similar to those illustrated in the first embodiment. Accordingly, the explanation thereof shall be omitted hereafter.

[0057]

Image-processing control device 40A has sensor 41A and assessment part 42A.

[0058]

As described above, sensor 41 in the first embodiment measures viewing distance D only. However, sensor 41A in the present embodiment differs from sensor 41 in that sensor 41A also measures the direction in which audience 60 is located relative to representation apparatus 50 (hereinafter, the "viewing direction").

[0059]

Figure 5 shows an illustrative drawing that illustrates an example of viewing distance D (which is the distance between representation apparatus 50 and audience 60) and the audience direction.

[0060]

Figure 5 (a) shows an example of representation apparatus 50 (a display device in this example) in the state in which representation apparatus 50 (a display device) is viewed from the front.

[0061]

Figure 5 (b) shows an illustrative drawing that illustrates examples of viewing distance D, i.e., the distance between representation apparatus 50 and audience 60, and the viewing direction in the state in which representation apparatus 50 shown in Figure 5 (a) is viewed from the top.

[0062]

The method used to measure viewing distance D in sensor 41A is similar to that of the first embodiment. Accordingly, the explanation thereof shall be omitted hereafter.

[0063]

Here, sensor 41A uses a line passing through the center of representation apparatus 50 anterior to the representation apparatus 50 as a reference line to determine the viewing direction by measuring the angle formed between the reference line and a straight line formed between the above-described center position and audience 60's position (hereinafter referred to as "viewing angle θ "), as shown in Figure 5(b). However, the viewing angle may be measured based on a different center position and reference line.

[0064]

In the same way as in the case of viewing distance D, an example of the method used to measure viewing angle θ in sensor 41A may involve the use of, for example, a motion sensor, a wireless IC tag, or the like, as described in relation to the "proximity detection means" according to Patent Document 2, whereby sensor 41A recognizes the positional relationship between audience 60 and representation apparatus 50 to thereby determine viewing angle θ . Figure 5 shows an example of detecting the two-dimensional direction of audience 60 relative to representation apparatus 50. However, sensor 41A may also be configured to detect the direction of audience 60 relative to representation apparatus 50 three-dimensionally (including the elevation angle).

[0065]

For example, by having audience 60 hold a wireless communication terminal (which, for example, may be built into a terminal used to operate representation apparatus 50, etc., such as a remote control terminal, a mobile phone terminal, or the like), it becomes possible for sensor 41A to communicate with the above-described wireless communication terminal so that sensor 41A can determine viewing angle θ by measuring the direction in which a wireless signal (e.g., radio waves, infrared rays, etc.) is acquired from the above-described wireless communication terminal. Wireless communication between the above-described wireless communication terminal and sensor 41 may be achieved through the use of light, such as radio waves or infrared

rays. However, there is no restriction on the communication method insofar as viewing angle θ can be measured.

[0066]

Another example of the method used to measure viewing angle θ in sensor 41A may involve installing multiple motion sensors around representation apparatus 50 and pre-registering the viewing angle for each motion sensor so as to recognize the positional relationship between audience 60 and representation apparatus 50 and detect viewing angle θ based on the positional relationship thus recognized. However, there is no restriction on the method used in sensor 41A insofar as viewing angle θ can be measured.

[0067]

While assessment part 42A in the first embodiment makes an assessment based only on viewing distance D, assessment part 42A in the present embodiment uses viewing distance D and viewing angle θ to make an assessment as mentioned above.

[0068]

Then, encoding controller 23 controls the content of the video-image encoding process performed by capturer 21 and encoder 22 according to the instructions from assessment part 42. For example, assessment part 42 gives instructions to encoding controller 23 so as to cause the amount of encoding throughput and the amount of post-encoding data to decrease as viewing distance D increases.

[0069]

For example, assessment part 42A may be configured to give instructions to encoding controller 23 so as to cause the transverse (horizontal) resolution to be lowered as viewing angle θ increases — e.g., so as to use a resolution applied based only on viewing distance D for comparison and multiply it by $\sqrt{3}/2$ when viewing angle θ is 30° but by $1/2$ when viewing angle θ is 60° to obtain the transverse (horizontal) resolution. Incidentally, when detecting the direction of audience 60 relative to representation apparatus 50 three-dimensionally (i.e., when including the elevation angle associated with the direction of audience 60 in the measurement), assessment part 42A may be configured to give instructions to encoding controller 23 so as to cause the longitudinal (vertical) resolution to be lowered as the elevation angle increases, for example.

[0070]

(B-2) Operation of the Second Embodiment

The following is an explanation of the image-processing control operation (image-processing control method according to the embodiment) in image communication system 1A, having the configuration described above according to the second embodiment.

[0071]

Figure 6 shows a diagram that illustrates the sequence of the operation involved in the video image processing control in the image communication system 1A.

[0072]

It is assumed, in Figure 6, that the video image data encoded by transmission device 20 is given to receiving device 30A and output from receiving device 30A to representation apparatus 50, and the video image is presented to audience 60 through representation apparatus 50 — from the beginning of the processing.

[0073]

First, sensor 41A measures viewing distance D and viewing angle θ (S201).

[0074]

Next, upon receipt of viewing distance D and viewing angle θ from sensor 41A, assessment part 42A sends out a signal, which controls the content of the encoding according to viewing distance D and viewing angle θ , to transmission device 20 (encoding controller 23) (S202).

[0075]

Upon receipt of the encoding-content control signal from assessment part 42A, encoding controller 23 controls capturer 21 and encoder 22 according to said signal, and subsequently, capturer 21 and encoder 22 continue to encode video images according to that content (S203).

[0076]

In step S203, similar to step S103 in the first embodiment described above, encoding controller 23 may be configured so as to not send a resolution-change instruction to capturer 21 and encoder 22 if it receives the same encoding resolution as the last encoding resolution used. Or, if encoding controller 23 receives a different encoding resolution from the last encoding resolution used, it may send a new encoding resolution to capturer 21 and encoder 22.

[0077]

Also, similar to the case of steps S101 through S103 in the first embodiment, there is no restriction on the timing of executing the process involved in the operation performed in steps S201 to S203.

[0078]

(B-3) Effects of the Second Embodiment

The second embodiment demonstrates the following effects in addition to the effects of the first embodiment:

[0079]

Image communication system 1A takes into account not only viewing distance D but also viewing angle θ to determine the content of the encoding performed by encoder 22. This makes it possible to include viewing angle θ in consideration for the determination of the content of the encoding performed by encoder 22 if viewing distance D is the same, thus making it possible to reduce the amount of throughput associated with the encoding and the amount of post-encoding data more than the first embodiment.

[0080]

(C) Other Embodiments

The present invention is not limited to the above-mentioned embodiments but can also include other variations, including those illustrated below:

[0081]

(C-1) In the first embodiment, a sensor detects viewing angle D and thereby determines the content of the encoding performed by the encoder. The second embodiment is illustrated with an example in which viewing distance D and viewing angle θ are detected for the determination of the content of the encoding performed by the encoder. However, only viewing angle θ may be detected for the determination of the content of the encoding performed by the encoder.

[0082]

(C-2) In the foregoing, all the embodiments assume that the image communication system has only one audience. However, there may be more than one audience. Even when there are multiple audiences, the method used to measure viewing distance D and viewing angle θ for each audience is the same as the above-mentioned embodiments. Accordingly, the detailed explanation shall be omitted hereafter. For instance, one of the following three examples may be used to measure viewing distance D and/or viewing angle θ for each audience.

[0083]

The first example employs a resolution that is determined based on the distance of the audience with the closest viewing distance D ;

[0084]

In the second example, viewing distance D and/or viewing angle θ are applied on the premise that there is one audience in the position corresponding to the center of gravity for all audiences' positions; or

[0085]

The third example employs the highest resolution among the resolutions that are calculated based on viewing distances D and viewing directions θ of the respective audiences.

[0086]

(C-3) All the embodiments described above assume that the encoder uploads and encodes live video images captured by the camera. However, the subjects of encoding performed by the encoder are not limited to live video images captured by the camera. For example, video images recorded on a medium, such as a videotape or DVD, may be encoded in a format used for transmission to the receiving device.

[0087]

(C-4) In the foregoing, all the embodiments described above assume that the image communication system has only one receiving device and one representation apparatus.

However, it is also possible to distribute image data from a transmission device to multiple receiving devices and representation apparatuses. In this case, the encoding controller on the transmission-device side may, for example, employ the resolution determined based on the distance of the audience with the closest viewing distance D , as selected from control instructions from multiple receiving devices (assessment parts).

[0088]

(C-5) In the foregoing, all the embodiments described above assume that the image communication system has a transmission device and a receiving device. However, the transmission device and receiving device may be configured as one unit. Or, some or all of the components of the transmission and receiving devices may be configured as separate units. As such, there is no restriction on the manners in which devices are divided in the image communication system.

EXPLANATION OF REFERENCE CODING

[0089]

- 1 ... Image communication system
- 10 ... Camera
- 20 ... Transmission device
- 21 ... Capturer
- 22 ... Encoder
- 23 ... Encoding controller
- 30 ... Receiving device
- 31 ... Decoder
- 32 ... Representation control part
- 40 ... Image-processing control device
- 41 ... Sensor
- 42 ... Assessment part
- D ... Viewing distance
- θ ... Viewing angle

Figure 1

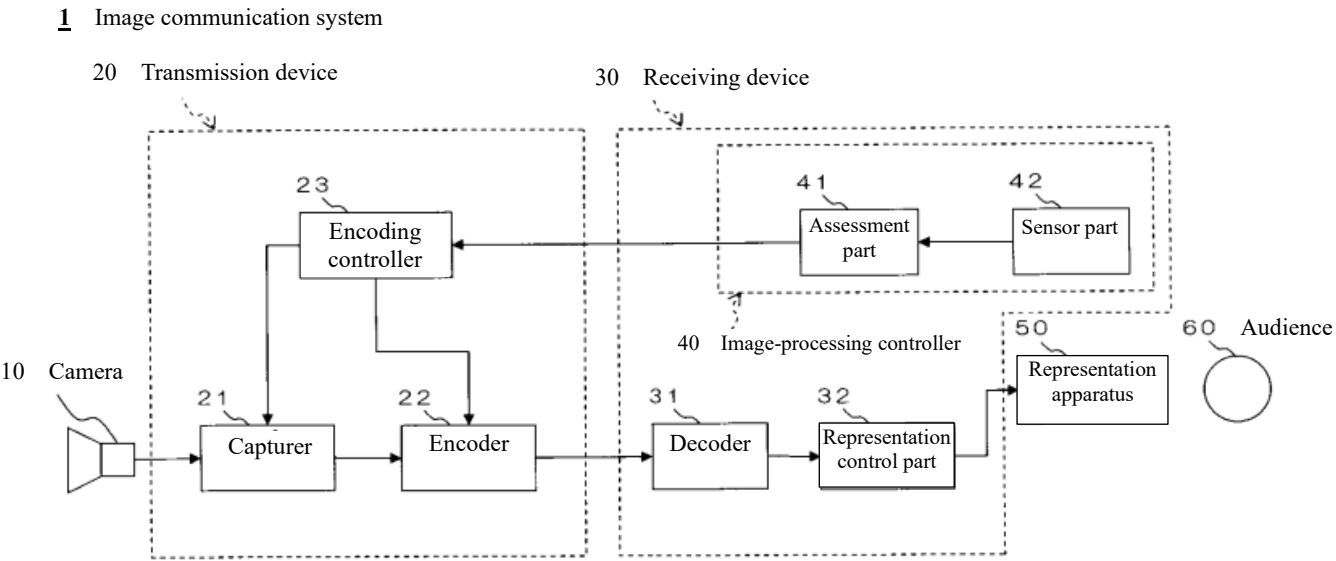
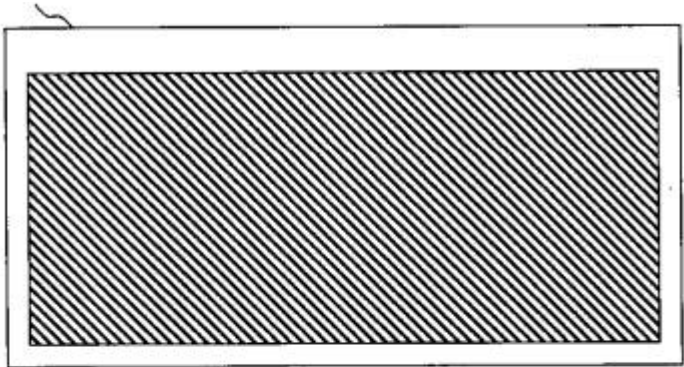


Figure 2

(a) 50 Representation apparatus (display screen)



(b) 50 Representation apparatus

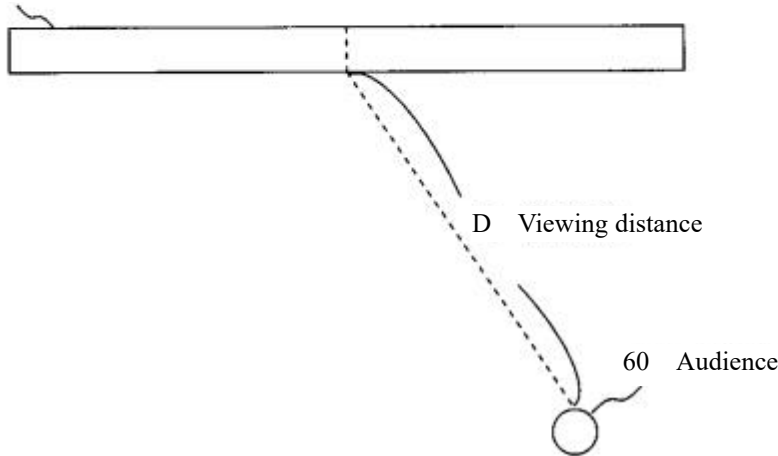


Figure 3

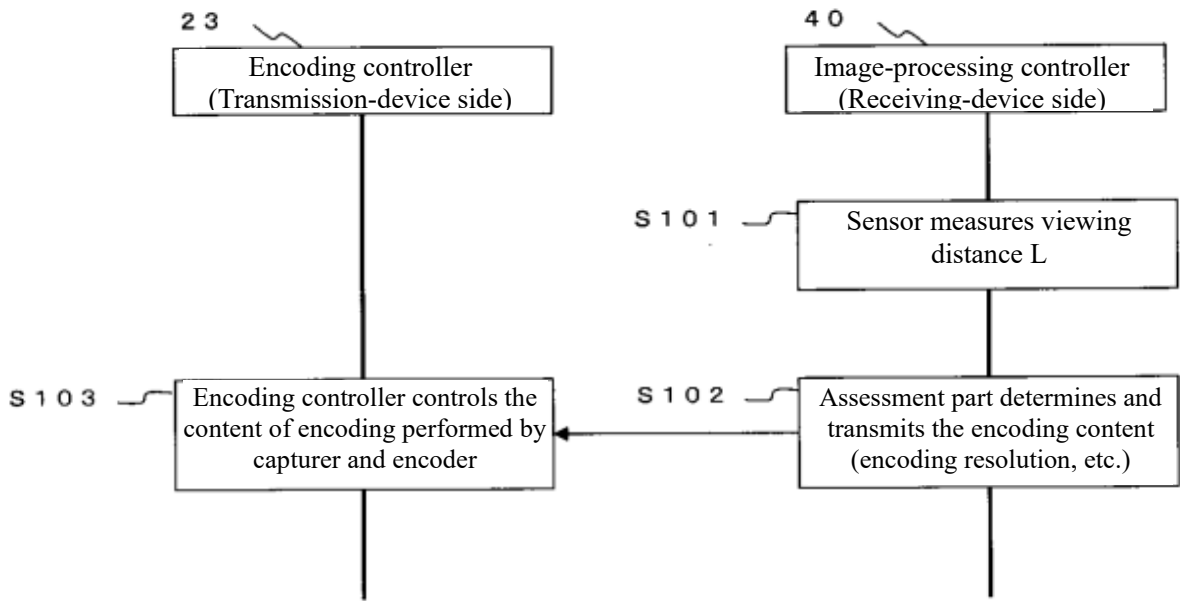


Figure 4

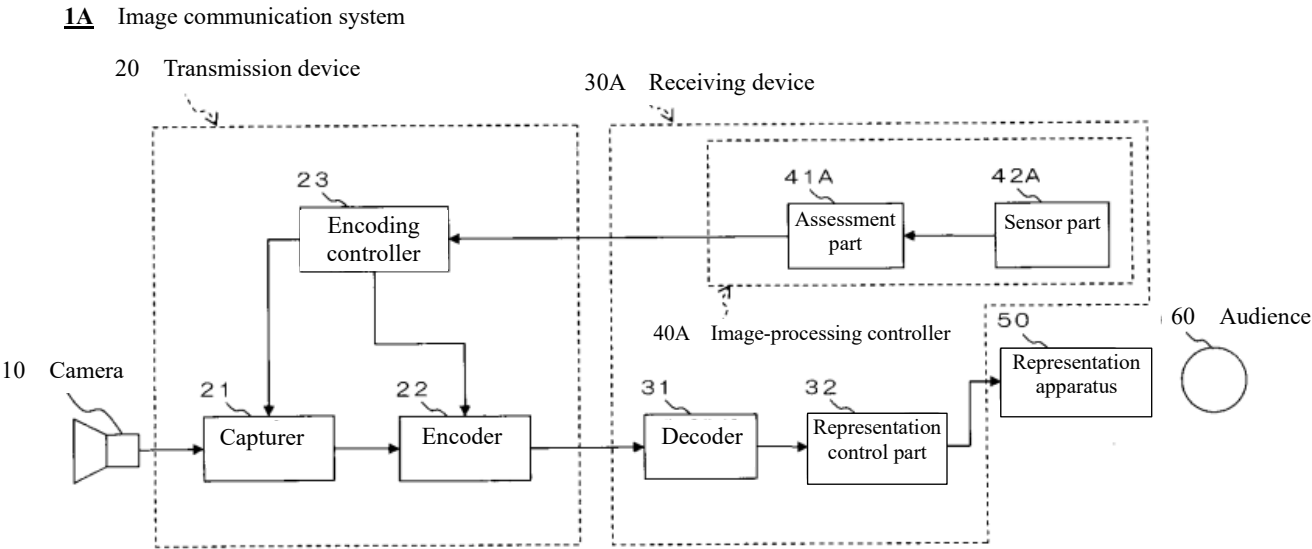
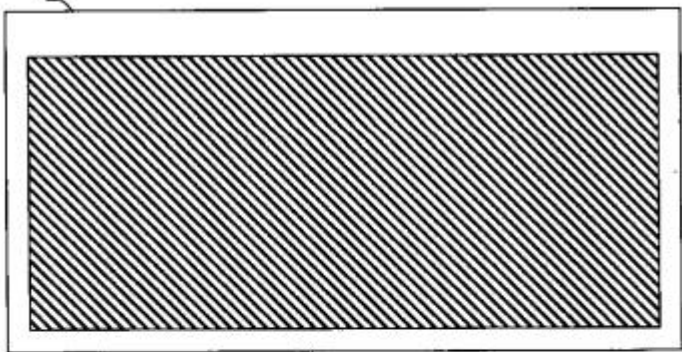


Figure 5

(a)

50 Representation apparatus (display screen)



(b)

50 Representation apparatus

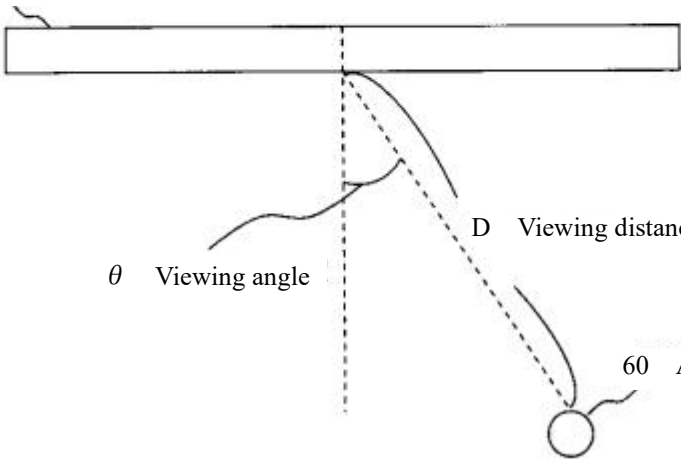
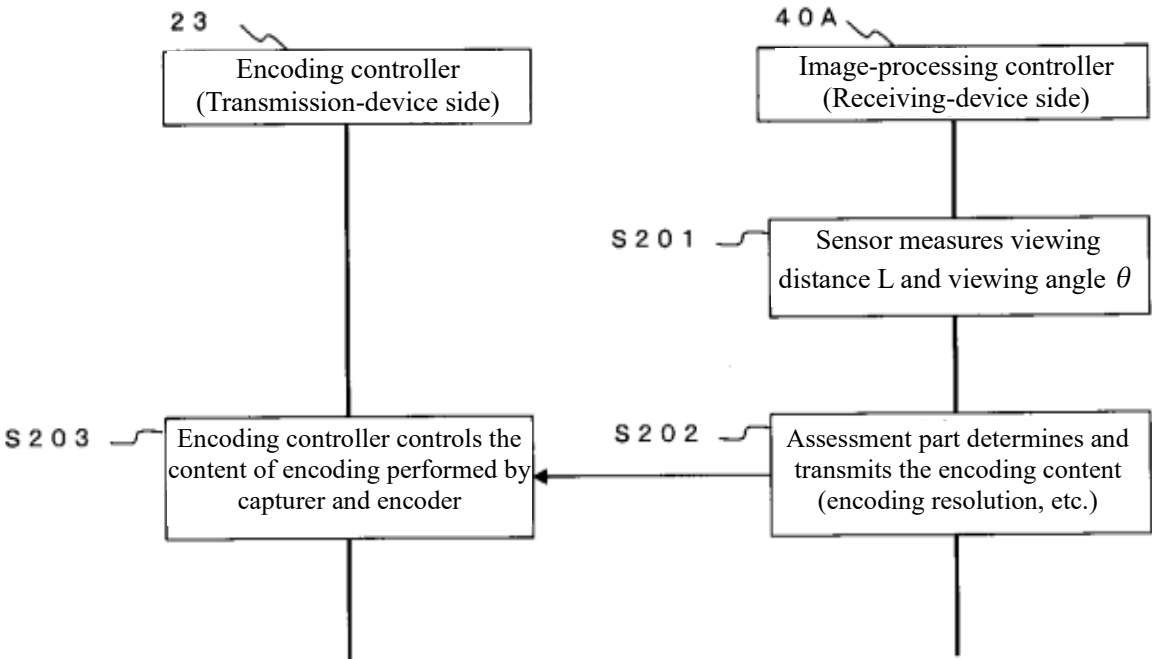


Figure 6



I, Yukie Hirose, hereby declare as follows:

1. I, Yukie Hirose, hereby certify that I am a professional translator fluent in both Japanese and English and I am competent to translate from Japanese into English.
2. I am a translator at Nelles Translations, which is located at 3 Grant Square, #336, Hinsdale, IL 60521.
3. I possess advanced knowledge of the Japanese and English languages.
4. The attached translation is, to the best of my knowledge and belief, a true and accurate translation from the Japanese patent JP2010-177777A to English.
5. I declare under penalty of perjury that all statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code.

Dated: 5/24/2024

A handwritten signature in black ink, appearing to read 'Yukie Hirose', is written over a solid black horizontal line.

Ms. Yukie Hirose