received in real time in the case (2). In both cases (1) and (2), if there is a packet that has not been received timely, it may be impossible to decode the entire frame of the packet. In addition, instead of a frame that cannot be fully or partially decoded due to packets that were not been received timely, the previous frame that could be decoded is displayed. As a result, the video being displayed stops as described above, causing the previous image to remain displayed.

[0009]

Thus, one objective of the present invention is to provide a system, a reception device, a transmission device, a method, a program, and a recording medium with the program recorded thereon, which allow transmitted videos to be reproduced in a real time manner without delay and the reproducibility of videos to be improved.

[0009a]

In one aspect, the present disclosure refers to a video communication method comprising dividing each of a plurality of still image frames of a video including the plurality of still image frames into a plurality of blocks, encoding the plurality of blocks individually on a per block basis, and transmitting an encoded block obtained by encoding a block of the plurality of blocks by a connectionless communication scheme and reconstructing, for each of the plurality of still image frames, a still image frame by allocating, at a corresponding position, a decoded block generated by decoding the encoded block of one said still image frame, the encoded block being received in an encoded block reception period corresponding to the one still image frame, wherein the encoded block reception period is a period from a current frame start time to a time at which a certain time has elapsed, the certain time being obtained by adding a margin time to an expected time for receiving all encoded blocks of one frame, wherein (1) when the encoded block, first transmitted, of the one still image frame is received within the encoded block reception period, a next frame start time is set to a time corresponding to a time at which one frame time has elapsed from a reception time of the encoded block of the one still image frame first received within the encoded block reception period, and (2) when the encoded block, first transmitted, of the one still image frame is not received and the transmitted encoded block of the one still image frame other than the first transmitted encoded block of the one still image frame is received within the encoded block reception period, a next frame start time is set to a time at which a certain time has elapsed from a time at which the encoded block of the one still image frame is first received, the certain time being a difference between the one frame time and an expected time for receiving encoded blocks ranging from the first transmitted encoded block of the one still image frame to an encoded block earliest in a transmission order among the

encoded blocks of the one still image frame, the encoded blocks being received within the encoded block reception period.

[0009b]

In another aspect, the present disclosure refers to an image reception method comprising, generating, for each of a plurality of still image frames, a decoded block by decoding an encoded block of one said still image frame, the encoded block being received in an encoded block reception period corresponding to the one still image frame, the encoded block being obtained by dividing each of the plurality of still image frames of a video including the plurality of still image frames into a plurality of blocks, and by encoding the plurality of blocks individually on a per block basis, and the encoded block being transmitted by a connectionless communication scheme, and reconstructing a still image frame by allocating, at a corresponding position, the generated decoded block, wherein the encoded block reception period is a period from a current frame start time to a time at which a certain time has elapsed, the certain time being obtained by adding a margin time to an expected time for receiving all encoded blocks of one frame, wherein (1) when the encoded block, first transmitted, of the one still image frame is received within the encoded block reception period, a next frame start time is set to a time corresponding to a time at which one frame time has elapsed from a reception time of the encoded block of the one still image frame first received within the encoded block reception period, and (2) when the encoded block, first transmitted, of the one still image frame is not received and the transmitted encoded block of the one still image frame other than the first transmitted encoded block of the one still image frame is received within the encoded block reception period, a next frame start time is set to a time at which a certain time has elapsed from a time at which the encoded block of the one still image frame is first received, the certain time being a difference between the one frame time and an expected time for receiving encoded blocks ranging from the first transmitted encoded block of the one still image frame to an encoded block earliest in a transmission order among the encoded blocks of the one still image frame, the encoded blocks being received within the encoded block reception period.

[0009c]

There is disclosed an image transmission method comprising dividing each of a plurality of still image frames of a video including the plurality of still image frames into a plurality of blocks, encoding the plurality of blocks individually on a per block basis, and transmitting an encoded block obtained by encoding a block of the plurality of blocks by a connectionless

communication scheme.

[0009d]

In yet another aspect, the present disclosure refers to a video communication system comprising an image dividing unit configured to divide each of a plurality of still image frames of a video including the plurality of still image frames into a plurality of blocks, an encoding unit configured to encode the plurality of blocks individually on a per block basis, a transmitting unit configured to transmit an encoded block obtained by encoding a block of the plurality of blocks by a connectionless communication scheme, a decoding unit configured to decode, for each of the plurality of still image frames, the encoded block of one said still image frame received in an encoded block reception period corresponding to the one still image frame to generate a decoded block, and a frame reconstruction unit configured to reconstruct a still image frame by allocating the generated decoded block at a corresponding position, wherein the encoded block reception period is a period from a current frame start time to a time at which a certain time has elapsed, the certain time being obtained by adding a margin time to an expected time for receiving all encoded blocks of one frame, the video communication system further comprising: a frame start time setting unit configured to perform setting such that, (1) when the encoded block, first transmitted, of the one still image frame is received within the encoded block reception period, a next frame start time is set to a time corresponding to a time at which one frame time has elapsed from a reception time of the encoded block of the one still image frame first received within the encoded block reception period, and (2) when the encoded block, first transmitted, of the one still image frame is not received and the transmitted encoded block of the one still image frame other than the first transmitted encoded block of the one still image frame is received within the encoded block reception period, a next frame start time is set to a time at which a certain time has elapsed from a time at which the encoded block of the one still image frame is first received, the certain time being a difference between the one frame time and an expected time for receiving encoded blocks ranging from the first transmitted encoded block of the one still image frame to an encoded block earliest in a transmission order among the encoded blocks of the one still image frame, the encoded blocks being received within the encoded block reception period.

[0009e]

In yet another aspect, the present disclosure refers to an image reception device comprising, a decoding unit configured to generate a decoded block obtained by decoding, for each of a plurality of still image frames, an encoded block of one said still image frame, the encoded block being received in an encoded block reception period

corresponding to the one still image frame, the encoded block being obtained by dividing each of the plurality of still image frames of a video including the plurality of still image frames into a plurality of blocks, and encoding the plurality of blocks individually on a per block basis, and the encoded block being transmitted by a connectionless communication scheme, and a frame reconstruction unit configured to reconstruct a still image frame by allocating, at a corresponding position, the generated decoded block, wherein the encoded block reception period is a period from a current frame start time to a time at which a certain time has elapsed, the certain time being obtained by adding a margin time to an expected time for receiving all encoded blocks of one frame, the image reception device further comprising: a frame start time setting unit configured to perform setting such that, (1) when the encoded block, first transmitted, of the one still image frame is received within the encoded block reception period, a next frame start time is set to a time corresponding to a time at which one frame time has elapsed from a reception time of the encoded block of the one still image frame first received within the encoded block reception period, and (2) when the encoded block, first transmitted, of the one still image frame is not received and the transmitted encoded block of the one still image frame other than the first transmitted encoded block of the one still image frame is received within the encoded block reception period, a next frame start time is set to a time at which a certain time has elapsed from a time at which the encoded block of the one still image frame is first received, the certain time being a difference between the one frame time and an expected time for receiving encoded blocks ranging from the first transmitted encoded block of the one still image frame to an encoded block earliest in a transmission order among the encoded blocks of the one still image frame, the encoded blocks being received within the encoded block reception period.

[0009f]

There is disclosed an image transmission device comprising an image dividing unit configured to divide each of a plurality of still image frames of a video including the plurality of still image frames into a plurality of blocks, an encoding unit configured to encode the plurality of blocks individually on a per block basis, and a transmitting unit configured to transmit an encoded block obtained by encoding a block of the plurality of blocks by a connectionless communication scheme.

[0009g]

There is disclosed a remote control device comprising the image transmission device according to the previous aspect, and an imaging device configured to supply a video to the image transmission

device.

[0010]

In addition, another objective of the present invention is to provide a system, a reception device, a transmission device, a method, a program, and a recording medium with the program recorded thereon, which allow states including a degraded communication state to be recognized in a real time manner without delay.

Solution to Problem

[0011]

An aspect of the present invention is to provide a video communication method including dividing each of a plurality of still image frames of a video including the plurality of still image frames into a plurality of blocks, encoding the plurality of blocks individually on a per block basis, and transmitting an encoded block obtained by encoding a block of the plurality of blocks by a connectionless communication scheme, and reconstructing, for each of the plurality of still image frames, a still image frame by allocating, at a corresponding position, a decoded block generated by decoding the encoded block of one said still image frame, the encoded block being received in an encoded block reception period corresponding to the one still image frame, in which the encoded block reception period is a period from a current frame start time to a time at

Claims

[Claim 1]

A video communication method comprising:

dividing each of a plurality of still image frames of a video including the plurality of still image frames into a plurality of blocks, encoding the plurality of blocks individually on a per block basis, and transmitting an encoded block obtained by encoding a block of the plurality of blocks by a connectionless communication scheme; and

reconstructing, for each of the plurality of still image frames, a still image frame by allocating, at a corresponding position, a decoded block generated by decoding the encoded block of one said still image frame, the encoded block being received in an encoded block reception period corresponding to the one still image frame; wherein

the encoded block reception period is a period from a current frame start time to a time at which a certain time has elapsed, the certain time being obtained by adding a margin time to an expected time for receiving all encoded blocks of one frame,

wherein

(1) when the encoded block, first transmitted, of the one still image frame is received within the encoded block reception period, a next frame start time is set to a time corresponding to a time at which one frame time has elapsed from a reception time of the encoded block of the one still image frame first received within the encoded block reception period, and

(2) when the encoded block, first transmitted, of the one still image frame is not received and the transmitted encoded block of the one still image frame other than the first transmitted encoded block of the one still image frame is received within the encoded block reception period, a next frame start time is set to a time at which a certain time has elapsed from a time at which the encoded block of the one still image frame is first received, the certain time being a difference between the one frame time and an expected time for receiving encoded blocks ranging from the first transmitted encoded block of the one still image frame to an encoded block earliest in a transmission order among the

encoded blocks of the one still image frame, the encoded blocks being received within the encoded block reception period.

[Claim 2]

The video communication method according to claim 1, wherein

the reconstructing the still image frame includes, for each of the plurality of still image frames, reconstructing a still image frame by allocating, at the corresponding position, the decoded block generated by decoding the encoded block of one said still image frame, the encoded block being received in the encoded block reception period corresponding to the one still image frame, and by allocating an image equivalent to a no-image signal to a portion in which the decoded block has not been allocated.

[Claim 3]

An image reception method comprising:

generating, for each of a plurality of still image frames, a decoded block by decoding an encoded block of one said still image frame, the encoded block being received in an encoded block reception period corresponding to the one still image frame, the encoded block being obtained by dividing each of the plurality of still image frames of a video including the plurality of still image frames into a plurality of blocks, and by encoding the plurality of blocks individually on a per block basis, and the encoded block being transmitted by a connectionless communication scheme; and

reconstructing a still image frame by allocating, at a corresponding position, the generated decoded block, wherein

the encoded block reception period is a period from a current frame start time to a time at which a certain time has elapsed, the certain time being obtained by adding a margin time to an expected time for receiving all encoded blocks of one frame,

wherein

(1) when the encoded block, first transmitted, of the one still image frame is received within the encoded block reception period, a next frame start time is set to a time corresponding to a time at which one frame time has elapsed from a reception time of the

encoded block of the one still image frame first received within the encoded block reception period, and

(2) when the encoded block, first transmitted, of the one still image frame is not received and the transmitted encoded block of the one still image frame other than the first transmitted encoded block of the one still image frame is received within the encoded block reception period, a next frame start time is set to a time at which a certain time has elapsed from a time at which the encoded block of the one still image frame is first received, the certain time being a difference between the one frame time and an expected time for receiving encoded blocks ranging from the first transmitted encoded block of the one still image frame to an encoded block earliest in a transmission order among the encoded blocks of the one still image frame, the encoded blocks being received within the encoded block reception period.

[Claim 4]

The image reception method according to claim 3, wherein

the reconstructing the still image frame includes, for each of the plurality of still image frames, reconstructing a still image frame by allocating, at the corresponding position, the decoded block generated by decoding the encoded block of one said still image frame, the encoded block being received in the encoded block reception period corresponding to the one still image frame, and by allocating an image equivalent to a no-image signal to a portion in which the decoded block has not been allocated.

[Claim 5]

The image reception method according to claim 3, wherein

the reconstructing the still image frame includes reconstructing a still image frame by allocating, for each of the plurality of still image frames, at the corresponding position, the decoded block generated by decoding the encoded block of one said still image frame, the encoded block being received in the encoded block reception period corresponding to the one still image frame, and for the portion in which the decoded block has not been allocated, by allocating, at the corresponding position, a decoded block at a position

corresponding to the portion, among decoded blocks generated by decoding encoded blocks of received past still image frames for each of the past still image frames ranging from a still image frame one-frame prior to the one still image frame to a still image frame a predetermined number of frames prior to the one still image frame, prioritizing a decoded block of a still image frame temporally closer to the one still image frame.

[Claim 6]

The image reception method according to any one of claims 3 to 5, wherein

a next frame start time is set to a time at which one frame time has elapsed from the current frame start time when all of the encoded blocks of the one still image frame are not received within the encoded block reception period.

[Claim 7]

The image reception method according to any one of claims 3 to 6, wherein

the plurality of encoded blocks are transmitted in an order obtained by rearranging a position order of the blocks of the still image frame.

[Claim 8]

The image reception method according to claim 7, wherein

the plurality of encoded blocks are transmitted in an order obtained by randomly rearranging the position order of the blocks of the still image frame.

[Claim 9]

The image reception method according to any one of claims 3 to 8, wherein

an encoding scheme for the video is a Motion JPEG-based scheme.

[Claim 10]

The image reception method according to any one of claims 3 to 9, wherein

the margin time is a difference between the one frame time and a sum of the expected time for receiving all encoded blocks of the one frame and the drawing time of the one frame in a case that the all blocks of the one frame are decoded.

[Claim 11]

The image reception method according to any one of claims 5 to 10, wherein

the expected time for receiving all encoded blocks of the one frame, the expected time for receiving encoded blocks ranging from the first transmitted encoded block of the one still image frame to the earliest encoded block in the transmission order among the encoded blocks of the one still image frame, the encoded blocks being received within the encoded block reception period, and/or the drawing time is determined based on a corresponding measured value, and is updated at a predetermined timing during reception of the video.

[Claim 12]

The image reception method according to claim 11, wherein

a value of the expected time for receiving all encoded blocks of the one frame, the expected time for receiving encoded blocks ranging from the first transmitted encoded block of the one still image frame to the earliest encoded block in the transmission order among the encoded blocks of the one still image frame, the encoded blocks being received within the encoded block reception period, and/or the drawing time to be determined based on the corresponding measured value, is updated at the predetermined timing during reception of the video.

[Claim 13]

A video communication system comprising:

an image dividing unit configured to divide each of a plurality of still image frames of a video including the plurality of still image frames into a plurality of blocks;

an encoding unit configured to encode the plurality of blocks individually on a per block basis;

a transmitting unit configured to transmit an encoded block obtained by encoding a block of the plurality of blocks by a connectionless communication scheme;

a decoding unit configured to decode, for each of the plurality of still image frames, the encoded block of one said still image frame received in an encoded block reception period corresponding to the one still image frame to generate a decoded block; and

a frame reconstruction unit configured to reconstruct a still image frame by allocating the generated decoded block at a corresponding position, wherein

the encoded block reception period is a period from a current frame start time to a time at which a certain time has elapsed, the certain time being obtained by adding a margin time to an expected time for receiving all encoded blocks of one frame,

the video communication system further comprising:

a frame start time setting unit configured to perform setting such that,

(1) when the encoded block, first transmitted, of the one still image frame is received within the encoded block reception period, a next frame start time is set to a time corresponding to a time at which one frame time has elapsed from a reception time of the encoded block of the one still image frame first received within the encoded block reception period, and

(2) when the encoded block, first transmitted, of the one still image frame is not received and the transmitted encoded block of the one still image frame other than the first transmitted encoded block of the one still image frame is received within the encoded block reception period, a next frame start time is set to a time at which a certain time has elapsed from a time at which the encoded block of the one still image frame is first received, the certain time being a difference between the one frame time and an expected time for receiving encoded blocks ranging from the first transmitted encoded block of the one still image frame to an encoded block earliest in a transmission order among the encoded blocks of the one still image frame, the encoded blocks being received within the encoded block reception period.

[Claim 14]

The video communication system according to claim 13, wherein

the frame reconstruction unit reconstructs a still image frame by allocating the generated decoded block at the corresponding position, and allocating an image equivalent to a no-image signal to a portion in which the decoded block has not been allocated.

[Claim 15]

An image reception device comprising:

a decoding unit configured to generate a decoded block obtained by decoding, for each of a plurality of still image frames, an encoded block of one said still image frame, the encoded block being received in an encoded block reception period corresponding to the one still image frame, the encoded block being obtained by dividing each of the plurality of still image frames of a video including the plurality of still image frames into a plurality of blocks, and encoding the plurality of blocks individually on a per block basis, and the encoded block being transmitted by a connectionless communication scheme; and

a frame reconstruction unit configured to reconstruct a still image frame by allocating, at a corresponding position, the generated decoded block, wherein

the encoded block reception period is a period from a current frame start time to a time at which a certain time has elapsed, the certain time being obtained by adding a margin time to an expected time for receiving all encoded blocks of one frame,

the image reception device further comprising:

a frame start time setting unit configured to perform setting such that,

(1) when the encoded block, first transmitted, of the one still image frame is received within the encoded block reception period, a next frame start time is set to a time corresponding to a time at which one frame time has elapsed from a reception time of the encoded block of the one still image frame first received within the encoded block reception period, and

(2) when the encoded block, first transmitted, of the one still image frame is not received and the transmitted encoded block of the one still image frame other than the first transmitted encoded block of the one still image frame is received within the encoded block reception period, a next frame start time is set to a time at which a certain time has elapsed from a time at which the encoded block of the one still image frame is first received, the certain time being a difference between the one frame time and an expected time for receiving encoded blocks ranging from the first transmitted encoded block of the one still image frame to an encoded block earliest in a transmission order among the encoded blocks of the one still image frame, the encoded blocks being received within the encoded block reception period.

[Claim 16]

The image reception device according to claim 15, wherein

the frame reconstruction unit reconstructs a still image frame by allocating the generated decoded block at the corresponding position, and allocating an image equivalent to a no-image signal to a portion in which the decoded block has not been allocated.

[Claim 17]

The image reception device according to claim 15, wherein

the frame reconstruction unit reconstructs a still image frame by allocating, for each of the plurality of still image frames, at the corresponding position, the decoded block generated by decoding the encoded block of one said still image frame, the encoded block being received in the encoded block reception period corresponding to the one still image frame, and for the portion in which the decoded block has not been allocated, by allocating, at the corresponding position, a decoded block at a position corresponding to the portion, among decoded blocks generated by decoding encoded blocks of received past still image frames for each of the past still image frames ranging from a still image frame one-frame prior to the one still image frame to a still image frame a predetermined

number of frames prior to the one still image frame, prioritizing a decoded block of a still image frame temporally closer to the one still image frame.

[Claim 18]

The image reception device according to any one of claims 15 to 17, wherein

the frame start time setting unit sets a next frame start time to a time at which one frame time has elapsed from the current frame start time when all of the encoded blocks of the one still image frame are not received within the encoded block reception period.

[Claim 19]

The image reception device according to any one of claims 15 to 18, wherein

the plurality of encoded blocks are transmitted in an order obtained by rearranging a position order of the blocks of the still image frame.

[Claim 20]

The image reception device according to claim 19, wherein

the plurality of encoded blocks are transmitted in an order obtained by randomly rearranging the position order of the blocks of the still image frame.