“CoaXPress,” the data transfer rate is standardized to 1.25 Gbps (effective transfer rate is about 1 Gbps) even when transferring the image data at the lowest rate. On the other hand, in the “GigE Vision” standard, the maximum data transfer rate is 1 Gbps (effective transfer rate is about 900 Mbps), so there is a problem in that when performing interface conversion of the image data from the “CoaXPress” to the “GigE Vision,” the communication band will lack. In particular, when the image data transmitted from a plurality of imaging devices are collectively transmitted to a single terminal device, the lack of communication band will be more significant.

[0009]

Embodiments of the present invention provide a multiplexer that can collectively convert image data acquired by a plurality of imaging devices adopting a certain data communication standard into another data communication standard and that can suppress the data transfer delay caused by the conversion. Embodiments of the present invention provide an imaging system including a plurality of such multiplexers and capable of suppressing the occurrence of differences in the imaging timing.

[Means for solving the Problems]

[0010]

According to a first aspect of the present invention, there is provided a multiplexer including: an input unit to which a plurality of image signals based on a first data communication standard are input, the image signals being acquired by respective imaging devices; an output unit that outputs an image signal based on a second data communication standard having a data transfer rate lower than that of the first data communication standard; a processing unit that converts the image signals based on the first data communication standard input to the input unit into the image signal based on the second data

communication standard; and a storage unit that temporarily buffers the image signals input from the input unit, wherein when each of the imaging devices is assumed to be an n-th imaging device (n=1 to m) and packet data input from the n-th imaging device (n=1 to m) to the input unit is n-th packet data (n=1 to m), the output unit sequentially outputs an image signal based on the second data communication standard converted from first packet data input from a first imaging device to the input unit to an image signal based on the second data communication standard converted from m-th packet data input from an m-th imaging device to the input unit, and the n-th packet data (n=1 to m) is data smaller than image data for one screen captured by the n-th imaging device (n=1 to m).

[0011]

According to the above aspect of the invention, in a system using a plurality of imaging devices adopting the first data communication standard, when converting into the second data communication standard having a data transfer rate lower than that of the first data communication standard, the image data from the plurality of imaging devices can be subjected to interface conversion with a single unit without preparing a unit for the conversion for each of the imaging devices. Moreover, even when the data transfer rate of the first data communication standard is higher than the data transfer rate of the second data communication standard, the input image data can be temporarily stored in the storage unit, and it is therefore possible to avoid the overflow due to the lack of bandwidth on the output side. Thus, since the image data acquired by the plurality of imaging devices adopting the first data communication standard can be collectively converted into the second data communication standard, the suppression of a delay in the data transfer due to the conversion is achieved.

[0012]

In an embodiment of the above aspect, the first data communication standard may be CoaXPress, and the second data communication standard may be GigE Vision.

[0013]

According to the above embodiment, the image data inputs from a plurality of imaging devices conforming to the "CoaXPress" standard can be received, and the data to be transmitted to a terminal device for image processing can be output in the "GigE Vision" standard; therefore, it is possible to construct an imaging system with a high degree of freedom in the installation location of the imaging devices and a simple device configuration.

[0014]

[0015]

In an embodiment of the above aspect, the n-th packet data (n=1 to m) may be image data for one pixel, a plurality of pixels, one line, or a plurality of lines that constitute one screen captured by the n-th imaging device (n=1 to m).

[0016]

When images are captured at the same time by a plurality of imaging devices, the image data is input at the same time to the input unit from respective imaging devices. If the image data is subjected to the interface conversion and output after the image data for one screen captured by each of the imaging devices is accumulated, then, as the number of images captured at the same time increases, the synchronicity of the captured images is lost and the transfer timing of the image data is delayed. According to the above embodiments, the image data can be sequentially output in a unit smaller than the image data for one screen captured by each of the imaging devices,

Claims

1. A multiplexer comprising:

an input unit to which a plurality of image signals based on a first data communication standard are input, the image signals being acquired by respective imaging devices;

an output unit that outputs an image signal based on a second data communication standard having a data transfer rate lower than that of the first data communication standard;

a processing unit that converts the image signals based on the first data communication standard input to the input unit into the image signal based on the second data communication standard; and

a storage unit that temporarily buffers the image signals input from the input unit, wherein

when each of the imaging devices is assumed to be an n-th imaging device (n=1 to m) and packet data input from the n-th imaging device (n=1 to m) to the input unit is n-th packet data (n=1 to m),

the output unit sequentially outputs an image signal based on the second data communication standard converted from first packet data input from a first imaging device to the input unit to an image signal based on the second data communication standard converted from m-th packet data input from an m-th imaging device to the input unit, and

the n-th packet data (n=1 to m) is data smaller than image data for one screen captured by the n-th imaging device (n=1 to m).

2. The multiplexer according to claim 1, wherein

the first data communication standard is CoaXPress, and

the second data communication standard is GigE Vision.

3. The multiplexer according to claim 1, wherein the n-th packet data (n=1 to m) is image data for one pixel, a plurality of pixels, one line, or a plurality of lines that constitute one screen captured by the n-th imaging device (n=1 to m).

4. An imaging system having a plurality of multiplexers according to any one of claims 1 to 3, the plurality of imaging devices being connected to each of the multiplexers, the imaging system comprising

a synchronization means that synchronizes respective times of the multiplexers.

5. The imaging system according to claim 4, wherein the synchronization means synchronizes the respective times of the multiplexers using a time synchronization protocol.