[Summary of Invention]

[Technical Problem]

[0005]

However, the conventional method is limited to a case in which a device to which the method is applied has three color light sources such as an illuminator. Embodiments of the present invention solve this problem, and provide an information communication method that enable communication between various devices including a device with low computational performance.

[Solution to Problem]

[0005a]

According to a first aspect of the preset invention, there is provided a method for obtaining information from a transmission device using an image sensor having a plurality of exposure lines, the method comprising: obtaining image data by performing imaging during a predetermined exposure time in which exposure of the plurality of exposure lines is started sequentially at different times and exposure of a next one of the plurality of exposure lines is started before exposure of a current one of the plurality of exposure lines is completed; and obtaining the information by demodulating data specified by a pattern of bright lines which appear in the image data and each of which corresponds to a different one of the plurality of exposure lines, wherein the predetermined exposure time is set so as to satisfy a relationship defined by $t_E + t_D < t_S$ where t_E denotes the predetermined exposure time, t_D denotes a time difference between a time at which exposure of the current exposure line is started and a time at which exposure of the next exposure line is started, and t_S denotes minimum change time which is a shorter one of a time from when a light source of the transmission device starts a fall from high luminance to low luminance to when the light source completes a rise from low luminance to high luminance and a time from when the light source starts a rise from low luminance to high luminance to when the light source completes a fall from high luminance to low luminance.

[0005b]

According to a second aspect of the present invention, there is

provided an information communication device which obtains information from a transmission device using an image sensor having a plurality of exposure lines, the device comprising: an image obtainment unit configured to obtain image data by performing imaging during a predetermined exposure time in which exposure of the plurality of exposure lines is started sequentially at different times and exposure of a next one of the plurality of exposure lines is started before exposure of a current one of the plurality of exposure lines is completed; and an information obtainment unit configured to obtain the information by demodulating data specified by a pattern of bright lines which appear in the image data and each of which corresponds to a different one of the plurality of exposure lines, wherein the information obtainment unit is configured to set the predetermined exposure time so as to satisfy a relationship defined by $t_E + t_D < t_S$ where t_E denotes the predetermined exposure time, t_D denotes a time difference between a time at which exposure of the current exposure line is started and a time at which exposure of the next exposure line is started, and t_S denotes minimum change time which is a shorter one of a time from when a light source of the transmission device starts a fall from high luminance to low luminance to when the light source completes a rise from low luminance to high luminance and a time from when the light source starts a rise from low luminance to high luminance to when the light source completes a fall from high luminance to low luminance.

[0005c]

According to a third aspect of the present invention, there is provided a recording medium storing a computer program for executing the above method.

[0005d]

According to a fourth aspect of the present invention, there is provided a method for distributing a computer program for executing the above method.

[0006]

Disclosed herein is an information communication method of obtaining information from a subject,

information communication method including: setting a first exposure time of an image sensor so that, in an image obtained by capturing the subject by the image sensor, a plurality of bright lines corresponding to a plurality of exposure lines included in the image sensor appear according to a change in luminance of the subject; obtaining a bright line image including the plurality of bright lines, by capturing the subject changing in luminance by the image sensor with the set first exposure time; and obtaining the information by demodulating data specified by a pattern of the plurality of bright lines included in the obtained bright line image, wherein in the obtaining of a bright line image, exposure starts sequentially for the plurality of exposure lines each at a different time, and exposure of each of the plurality of exposure lines starts after a predetermined blank time elapses from when exposure of an adjacent exposure line adjacent to the exposure line ends.

[0007]

These general and specific aspects may be implemented using a system, a method, an integrated circuit, a computer program, or a computer-readable recording medium such as a CD-ROM, or any combination of systems, methods, integrated circuits, computer programs, or computer-readable recording media.

[Advantageous Effects of Invention]

[0008]

An information communication method as per embodiments of the present invention enable communication between various devices including a device with low computational performance.

[Brief Description of Drawings]

[0009]

These and other aspects, advantages and features of the disclosure will become apparent from the following description thereof taken in conjunction with the accompanying drawings that illustrate a specific embodiment of the present invention.

[FIG. 1]

FIG. 1 is a timing diagram of a transmission signal in an information communication device in Embodiment 1.

[FIG. 2]

FIG. 2 is a diagram illustrating relations between a transmission signal and a reception signal in Embodiment 1.

[FIG. 3]

FIG. 3 is a diagram illustrating relations between a transmission signal and a reception signal in Embodiment 1.

[FIG. 4]

FIG. 4 is a diagram illustrating relations between a transmission signal and a reception signal in Embodiment 1.

[FIG. 5]

FIG. 5 is a diagram illustrating relations between a transmission signal and a reception signal in Embodiment 1.

[FIG. 6]

FIG. 6 is a diagram illustrating relations between a transmission signal and a reception signal in Embodiment 1.

[FIG. 7]

FIG. 7 is a diagram illustrating a principle in Embodiment 2.

[FIG. 8]

FIG. 8 is a diagram illustrating an example of operation in Embodiment 2.

[FIG. 9]