DESCRIPTION

Title of Invention: PICTURE DISPLAY METHOD AND PICTURE DISPLAY DEVICE

Technical Field

[0001]

The present disclosure relates to a picture display method for displaying pictures, and so forth.

Background Art

[0002]

There conventionally has been proposed a picture display method where picture is displayed on a panel where LEDs (Light Emitting Diode) are arrayed in a matrix (LED panel) (e.g., see PTL 1). The gradient of light-emission luminance of the LEDs is adjusted by PWM control in this picture display method.

Citation List

Patent Literature

[0003]

PTL 1: Japanese Unexamined Patent Application Publication No. 2012-227458

Summary

[0004]

However, the picture display method in the above PTL 1 has a problem that display of pictures and transmission of visible light signals cannot be appropriately performed.

[0005]

According to a first aspect of the present disclosure, there is provided a display device comprising a plurality of light sources, a first circuit that, with regard to each of first groups configured of a first predetermined number of light sources out of the plurality of light sources, controls on or off of a first switch connected to the first predetermined number of light sources; a second circuit that, with regard to each of second groups configured of a second predetermined number of light sources out of the plurality of light sources, that is different from the first groups, controls on or off of a second switch connected to the second predetermined number of light sources; and a first obtaining unit that obtains visible light signals

that transmit signals by causing luminance change of one or more light sources included in the plurality of light sources, wherein in a case of causing luminance change of the one or more light sources in accordance with the visible light signals, the first circuit turns the first switch on for the first groups including the one or more light sources, the second circuit switches on or off of the second switch of the second groups including the one or more light source, in accordance with the visible light signals, and in a case where the first switch and the second switch are on, current flows to the one or more light sources, and in a case where one of the first switch and the second switch are off, current does not flow to the one or more light sources.

[0006]

According to a second aspect of the present disclosure, there is provided a control method, comprising obtaining visible light signals that transmit signals by causing luminance change of one or more light sources included in a plurality of light sources; turning on, for each of each of first groups configured of a first predetermined number of light sources out of the plurality of light sources, a first switch connected to the first predetermined number of light sources, with regard to a first circuit that controls turning on and off of the first switch, switching between on and off in accordance with the visible light signals, for each of each of second groups configured of a second predetermined number of light sources out of the plurality of light sources, a second switch connected to the second predetermined number of light sources, with regard to a second circuit that controls turning on and off of the second switch, wherein, in a case where the first switch and the second switch are on, current flows to the one or more light sources, and in a case where one of the first switch and the second switch are off, current does not flow to the one or more light sources.

[0006a]

Accordingly to yet another aspect of the present disclosure, there is provided a computer-executable program that executes the control method according to the second aspect.

[0007]

It should be noted that these general or specific embodiments may be implemented as a system, a method, a device, an integrated circuit, a computer program, or a computer-readable recording medium such as a CD-ROM, and may

be realized by any combination of a system, method, device, integrated circuit, computer program, and recording medium.

[0008]

Brief Description of Drawings

[0009]

[Fig. 1] Fig. 1 is a diagram illustrating a configuration of a picture display device assumed from a conventional picture display method, and an example of picture display on an LED panel of that picture display device.

[Fig. 2] Fig. 2 is a sequence diagram of signals and currents in the picture display device assumed from the conventional picture display method.

[Fig. 3] Fig. 3 is a block diagram illustrating a configuration example of a picture display device according to an embodiment.

[Fig. 4] Fig. 4 is a diagram illustrating an example of timings of signals used in the picture display device according to the embodiment.

[Fig. 5] Fig. 5 is a diagram illustrating the relation between slot width and pulse width of light ID in the embodiment.

[Fig. 6] Fig. 6 is a diagram for describing a lighting format of an LED panel in the embodiment.

[Fig. 7A] Fig. 7A is a diagram illustrating an example of timings of signals

CLAIMS

1. A display device, comprising:

a plurality of light sources,

a first circuit that, with regard to each of first groups configured of a first predetermined number of light sources out of the plurality of light sources, controls on or off of a first switch connected to the first predetermined number of light sources;

a second circuit that, with regard to each of second groups configured of a second predetermined number of light sources out of the plurality of light sources, that is different from the first groups, controls on or off of a second switch connected to the second predetermined number of light sources; and

a first obtaining unit that obtains visible light signals that transmit signals by causing luminance change of one or more light sources included in the plurality of light sources,

wherein in a case of causing luminance change of the one or more light sources in accordance with the visible light signals,

the first circuit turns the first switch on for the first groups including the one or more light sources,

the second circuit switches on or off of the second switch of the second groups including the one or more light source, in accordance with the visible light signals, and

in a case where the first switch and the second switch are on, current flows to the one or more light sources, and in a case where one of the first switch and the second switch are off, current does not flow to the one or more light sources.

2. The display device according to Claim 1,

wherein the one or more light sources are connected to the first switch and the second switch.

3. The display device according to Claim 2, further comprising:

a second obtaining unit that obtains picture signals,

wherein, in a case of controlling the one or more light sources in accordance with visible light signals in the first period, and displaying a picture in a second

period that is different from the first period,

in the first period,

the first circuit turns on the first switch that is connected to the first groups including the one or more light sources, and

the second circuit turns on or off of the second switch connected to the second groups including the one or more light sources, in accordance with the visible light signals,

and in the second period,

the first circuit turns on or off of the first switch connected to the plurality of light sources for each of the first groups, in accordance with the picture signals, and

the second circuit switches on the second switch connected to the plurality of light sources.

4. The display device according to Claim 3,

wherein the plurality of lights sources are arrayed in a rectangular form that is n rows by m columns,

wherein the first groups correspond to each column in the m columns,

and wherein the second groups correspond to each row in the n rows.

5. The display device according to Claim 4,

wherein the value of n is the same as the value of m.

6. The display device according to Claim 1,

wherein the second switch is a driver circuit.

7. The display device according to Claim 1,

wherein the second switch is a transistor.

8. The display device according to any one of Claims 4 through 7,

wherein the second circuit performs control of turning the second switch on or off in common for each of a predetermined number of the second groups, out of the plurality of second groups.

9. The display device according to Claim 3,

wherein, in the second period,

the first circuit turns the first switch connected to the first groups on during a period for displaying a gradient where a correction gradient has been subtracted from a gradient of the picture display, and

the second circuit leaves the second switch connect to the second groups on, and does not perform switching control.

10. The display device according to Claim 9,

wherein the correction gradient is calculated based on a lit period of the one or more light sources light when controlling the one or more light sources in accordance with the visible light signals.

11. A control method, comprising:

obtaining visible light signals that transmit signals by causing luminance change of one or more light sources included in a plurality of light sources;

turning on, for each of each of first groups configured of a first predetermined number of light sources out of the plurality of light sources, a first switch connected to the first predetermined number of light sources, with regard to a first circuit that controls turning on and off of the first switch,

switching between on and off in accordance with the visible light signals, for each of each of second groups configured of a second predetermined number of light sources out of the plurality of light sources, a second switch connected to the second predetermined number of light sources, with regard to a second circuit that controls turning on and off of the second switch,

wherein, in a case where the first switch and the second switch are on, current flows to the one or more light sources, and in a case where one of the first switch and the second switch are off, current does not flow to the one or more light sources.

12. A computer-executable program that executes the control method according to Claim 11.