

METHOD FOR REGULATING LIGHT EMITTING DIODE OF DISPLAY DEVICE

BACKGROUND OF THE INVENTION 51. Field of the Invention This invention falls within the technical field of display devices that takes a LED (light emitting diode) as a backlight source. In particular, it is a method for regulating LEDs of display devices. 2. Description of Related Technology 10LED display systems first arose in the 1990s. Recently, TV markets have gradually transformed into markets for such large-sized TVs as digital TVs, front-projection TVs, rear projection TV, etc. With few exceptions, the light source used by projection TVs is high voltage mercury lamps. However, mercury lamps may seriously endanger the environment. To prevent public harm, much research has gone into developing substitutes. One such substitute that has caught the public eye is the idea of LEDs that work as small halogen lamps and using them as a substitute light source. 15This invention falls within the technical field of display devices that takes a LED (light emitting diode) as a backlight source. In particular, it is a method for regulating LEDs of display devices. The wavelengths of light corresponding to colors visible by human beings are between 400 and 780. Beyond the that range is

2. Description of Related Technology

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LED stands for light emitting diodes. The technology utilizes a principle that converts electrical energy into optical energy by imposing voltages on two terminals, positive pole and a negative pole, within a semiconductor. When current passes through, 20 it causes electrons to collide with the holes, and residual energy is released in the form of light. As a function of different material choices and energy levels, photon energy will generate light of different wavelengths. The wavelengths of light corresponding to colors visible by human beings are between 400 and 780. Beyond the that range is

invisible light, including infrared and ultraviolet ray. Many LEDs are so called III-V compound semiconductors created by combining V ground elements (nitride N, phosphor P, arsenic As) with III group elements (aluminum Al, gallium Ga, Indium In) to differentiate IV group elements of silicon Si used by IC 5 (integrated circuit) semiconductors. LEDs may generate light during collision under forward bias voltages when electrons flow through junctions. An LED display panel is a prime example of this technology in action. These panels consist of a multitude of pixels arranged to form a plane, where each pixel is composed of a multitude of red, blue and green LEDs. The winking of each pixel is regulated by a 10 control circuit to achieve the effect of producing different colors while regulating the darkness and light mixing ratio. Therefore, the LED display screen can display a static pattern or a dynamic pattern. However, when the LED display device regulates color, the color lights generated by displays blue, the brightness emitted by the blue LED is 1000cd, only 10% of the red, green, and blue LEDs are mixed into the required color light at proper level is often felt by viewers to be insufficient.

15 proportion. When the red, green, and blue LEDs are arranged and lighted up at a specific ratio, the LED display device produces white light. The white light brightness produced under these conditions is the maximum light-emitting brightness of the LED display device; the brightness ratio of each color light, in turn, is referred to as the "white balance". Normally, while in white balance, the brightness ratio of the red, green and
20 blue LEDs is about 3:6:1. In another word, when the brightness of white light is 10000cd, the white light is composed of red light 3000cd, green light 6000cd and blue light 1000cd. In a conventional LED display device, the maximum brightness emitted by each color LED is restricted to the white balance brightness level. In other words, when any single color is displayed, that color's brightness value will not exceed the display

5 SUMMARY OF THE INVENTION In view of the shortcomings of prior technologies, the developers of the present invention conducted extensive research and experiments based on years of experience in the industry, and finally developed a method for regulating the LED of display devices 10 such that the light-emitting brightness of a blue LED can be further improved through a binary coding and a communication protocol so as to enhance the display effect when the red LED and the blue LED are unlit. To achieve the aforementioned objective, the method for regulating LED of display devices comprises the following steps: providing a multitude of LEDs, composed of a 15 multitude of red, green and blue LEDs; establishing a communication protocol to output correspondingly driving current to drive the LEDs emitting light, the communication protocol corresponding to a binary coding, each binary coding respectively corresponding to the LEDs having different light emitting colors; allowing a light-emitting brightness of the blue LED to be 10% brightness during white balance 20 while simultaneously lighting the red LED, the green LED and the blue LED to achieve the brightness at white balance, where if the red LED and the green LED are unlit, the light-emitting brightness of the blue LED is further enhanced to improve display effect. The binary coding can be (but is not limited to) binary two bit coding, binary three bit coding, binary four bit coding, binary eight bit coding or binary sixteen bit coding. When the binary coding is a binary three-bit coding and the binary three-bit coding is "000", the red LED, the green LED and the blue LED are retained unlit, 10 such that the light-emitting brightness of a blue LED can be further improved through a binary coding and a communication protocol so as to enhance the display effect when images, and the light-emitting

the red LED and the blue LED are unlit.

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15 multitude of red, green and blue LEDs; establishing a communication protocol to output correspondingly driving current to drive the LEDs emitting light, the communication protocol corresponding to a binary coding, each binary coding respectively corresponding to the LEDs having different light emitting colors; allowing a light-emitting brightness of the blue LED to be 10% brightness during white balance
20 while simultaneously lighting the red LED, the green LED and the blue LED to achieve the brightness at white balance, where if the red LED and the green LED are unlit, the light-emitting brightness of the blue LED is further enhanced to improve display effect.

The binary coding can be (but is not limited to) binary two bit coding, binary three bit coding, binary four bit coding, binary eight bit coding or binary sixteen bit coding.

5 brightness of the blue LED is increased to 120% of the brightness emitted at white balance. When the binary coding is the binary three-bit coding and the binary three-bit coding is "010", the red LED and the blue LED are retained at non-lighting state, and the light-emitting brightness of the green LED equals the emitted brightness during white balance. When the binary coding is binary three-bit coding and the binary three-bit coding is "011", the red LED is retained unlit, and the light-emitting brightness of the green LED and the light-emitting brightness of the blue LED equal the emitted brightness during white balance. When the binary coding is binary three-bit coding and the binary three-bit coding is "100", the green LED and the blue LED are retained unlit, and the light-emitting brightness of the red LED equals the emitted brightness during white balance.. brightness of the blue LED is increased to 120% of the brightness emitted at white balance. When the binary coding is the binary three-bit coding and the binary three-bit coding is "101", the green LED is retained unlit, and the light-emitting brightness of the red LED and the light-emitting brightness of the blue LED equal the emitted brightness during white balance. When the binary coding is the binary three-bit coding and the binary three-bit coding is "110", the blue LED is retained unlit, and the light-emitting brightness of the red LED and the light-emitting brightness of the green LED equal the emitted brightness during white balance.

10 white balance.

When the binary coding is binary three-bit coding and the binary three-bit coding is "011", the red LED is retained unlit, and the light-emitting brightness of the green LED and the light-emitting brightness of the blue LED equal the emitted brightness during white balance.

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When the binary coding is the binary three-bit coding and the binary three-bit coding is "110", the blue LED is retained unlit, and the light-emitting brightness of the red LED and the light-emitting brightness of the green LED equal the emitted brightness

during white balance. When the binary coding is the binary three-bit coding and the binary three-bit coding is "1 1 1", the light-emitting brightness of the red LED, the light-emitting brightness of the blue LED and the light-emitting brightness of the green LED equal the emitted brightness during white balance, and the displayed color is white. The light-emitting brightnesses of the red LED, the green LED and the blue LED can be controlled by pulse width modulation. BRIEF DESCRIPTION OF THE DRAWINGS FIG. 1 is a schematic diagram of a display device corresponding to a method for regulating the LED of display devices according to the invention, FIG. 2 is a flowchart of a method for regulating the LED of display devices according to the invention, FIG. 3 is a brightness value table corresponding to a method for regulating the LED of display devices according to the invention, and the displayed color is white.

The light-emitting brightnesses of the red LED, the green LED and the blue LED can be controlled by pulse width modulation.

BRIEF DESCRIPTION OF THE DRAWINGS

10 FIG. 1 is a schematic diagram of a display device corresponding to a method for regulating the LED of display devices according to the invention;

FIG. 2 is a flowchart of a method for regulating the LED of display devices according to the invention;

15 FIG. 3 is a brightness value table corresponding to a method for regulating the LED of display devices according to the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The technical content of the present invention will become apparent by the detailed description of the following embodiments and the corresponding illustrations.

20 FIG. 1 shows a schematic diagram of a display device corresponding to a method for regulating LEDs of display devices according to the invention. In the figure, display

The technical content of the present invention will become apparent by the detailed description of the following embodiments and the corresponding illustrations. 20FIG. 1 shows a schematic diagram of a display device corresponding to a method for device 1 is composed of a multitude of LEDs. The LEDs are composed of a multitude of red LEDs 11, a multitude of green LEDs 12 and a multitude of blue LEDs 13. Each red LED 11, each green LED 12 and each blue LED 13 form a pixel 2. These pixels can be used for displaying text or images. 5FIG 2 depicts a flowchart of a method for regulating LEDs of display devices according to an invention. The method for regulating LED of display device comprises the following steps: S 11: provide a multitude of LEDs, where the LEDs are composed of a multitude of red LEDs, a multitude of green LEDs and a multitude of blue LEDs. 10S12: establish a communication protocol to output corresponding driving current to drive the LEDs for emitting light, where the communication protocol corresponds to a binary coding, and each binary coding respectively corresponds to LEDs having different light emitting colors. S13: allow the light-emitting brightness of the blue LED to be 10% brightness during white balance while simultaneously lighting the red LED, the green LED and the blue LED. If the red LED and the green LED are unlit, the light emitting brightness of the blue LED is further increased to improve display effect.

red LEDs, a multitude of green LEDs and a multitude of blue LEDs.

10 S12: establish a communication protocol to output corresponding driving current to drive the LEDs for emitting light, where the communication protocol corresponds to a binary coding, and each binary coding respectively corresponds to LEDs having different light emitting colors.

15 S13: allow the light-emitting brightness of the blue LED to be 10% brightness during white balance while simultaneously lighting the red LED, the green LED and the blue LED. If the red LED and the green LED are unlit, the light emitting brightness of the blue LED is further increased to improve display effect.

The binary coding can be (but is not limited to) binary two-bit, three-bit, four-bit, eight-bit, or sixteen-bit coding.

20 When the binary coding is binary three-bit coding, it can correspond to eight display states, such as "000", "001", "010", "011", "100", "101", "110" and "111", and red light, green light and blue light can be respectively controlled from left to right as shown in

The binary coding can be (but is not limited to) binary two-bit, three-bit, four-bit, eight-bit, or sixteen-bit coding. 20 When the binary coding is binary three-bit coding, it can correspond to eight display states, such as "000", "001", "010", "011", "100", "101", "110" and "111", and red light, green light and blue light can be respectively controlled from left to right as shown in FIG. 3. When the display device 1 achieves white balance, the brightness ratio respectively emitted by the red LED 11, the green LED 12, and the blue LED 13 is about 3:6:1. For example, while displaying the brightness of the white light as 1000cd, the brightness of the white light is composed of a mix of red light, which has 3000cd, emitted by the red LED 11, green light, which has 6000cd, emitted by the green LED 12, and blue light, which has 1000cd, emitted by the blue LED 13. When the binary coding is binary three-bit coding and the binary coding is "000", the red LED, the green LED and the blue LED remain unlit (0cd). When the binary coding is binary three-bit coding and the binary coding is "001", the red LED and the green LED are 10 remain unlit (0cd) to display pure blue images. At this time, the light-emitting brightness (1000cd) of the blue LED is increased to 120% (1200cd) the brightness emitted at white balance. Since the display brightness of the blue LED is improved, the user can obtain clear blue display images.

When the binary three-bit coding is "001", the red LED and the green LED are
 10 remain unlit (0cd) to display pure blue images. At this time, the light-emitting brightness (1000cd) of the blue LED is increased to 120% (1200cd) the brightness emitted at white balance. Since the display brightness of the blue LED is improved, the user can obtain clear blue display images.

When the binary coding is the binary three-bit coding and the binary three-bit coding
 15 is "010", the red LED and the blue LED remain unlit (0cd). At this time, the light-emitting brightness (6000cd) of the green LED equals the emitted brightness during white balance.

When the binary coding is the binary three-bit coding and the binary three-bit coding is "011", the red LED (0cd) remains unlit. At this time, the light-emitting
 20 brightness (6000cd) of the green LED and the light-emitting brightness (1000cd) of the blue LED equal the emitted brightness during white balance.

When the binary coding is the binary three-bit coding and the binary three-bit coding

When the binary coding is the binary three-bit coding and the binary three-bit coding is "010", the red LED and the blue LED remain unlit (0cd). At this time, the light-emitting brightness (6000cd) of the green LED equals the emitted brightness during white balance. When the binary coding is the binary three-bit coding and the binary three-bit coding is "100", the green LED and the blue LED remain unlit (0cd). At this time, the light-emitting brightness (6000cd) of the green LED and the light-emitting brightness (1000cd) of the blue LED equal the emitted brightness during white balance. When the binary coding is the binary three-bit coding and the binary three-bit coding is "101", the green LED remains unlit (0cd). At this time, the light-emitting brightness (3000cd) of the red LED equals the emitted brightness during white balance. When the binary coding is the binary three-bit coding and the binary three-bit coding is "110", the blue LED remains unlit (0cd). At this time, the light-emitting brightness (3000cd) of the red LED and the light-emitting brightness (6000cd) of the green LED equal the emitted brightness during white balance. When the binary coding is the binary three-bit coding and the binary three-bit coding is "111", the light-emitting brightness (3000cd) of the red LED, the light-emitting brightness (1000cd) of the blue LED and the light-emitting brightness (6000cd) of the green LED equal the emitted brightness during white balance. Here, the displayed color is white.

5 is "101", the green LED remains unlit (0cd). At this time, the light-emitting brightness (3000cd) of the red LED and the light-emitting brightness (1000cd) of the blue LED equal the emitted brightness during white balance.

When the binary coding is the binary three-bit coding and the binary three-bit coding is "110", the blue LED remains unlit (0cd). At this time, the light-emitting brightness (3000cd) of the red LED and the light-emitting brightness (6000cd) of the green LED equal the emitted brightness during white balance.

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When the binary coding is the binary three-bit coding and the binary three-bit coding is "111", the light-emitting brightness (3000cd) of the red LED, the light-emitting brightness (1000cd) of the blue LED and the light-emitting brightness (6000cd) of the green LED equal the emitted brightness during white balance. Here, the displayed color is white.

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In the embodiment, the light-emitting brightnesses of the red LED, the green LED and the blue LED can be controlled by means of pulse width modulation (PWM). Alternatively, the light-emitting brightnesses can be controlled by increasing driving current.

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Therefore, to obtain clearly pure blue display images, the red LED and the green LED are kept unlit (0cd). At this time, the light-emitting brightness (1000cd) of the blue

When the binary coding is the binary three-bit coding and the binary three-bit coding 5 is "101", the green LED remains unlit (0cd). At this time, the light-emitting brightness (3000cd) of the red LED and the light-emitting brightness (1000cd) of the blue LED equal the emitted brightness during white balance. When the binary coding is the binary three-bit coding and the binary three-bit coding is "110", the blue LED remains unlit (0cd). At this time, the light-emitting brightness (3000cd) of the red LED and the light-emitting brightness (6000cd) of the green LED equal the emitted brightness during white balance. When the binary coding is the binary three-bit coding and the binary three-bit coding is "111", the light-emitting brightness (3000cd) of the red LED, the light-emitting brightness (1000cd) of the blue LED and the light-emitting brightness (6000cd) of the green LED equal the emitted brightness during white balance. Here, the displayed color is white. In the embodiment, the light-emitting brightnesses of the red LED, the green LED and the blue LED can be controlled by a microcontroller (not shown) set by reference drawings, numerous modifications and variations could be made thereto by those skilled in the art without departing from the scope and spirit of the invention. Alternatively, the light-emitting brightnesses can be controlled by increasing or decreasing the current of the LEDs. The modifications and variations should be limited in range by the blue display images, the red LED and the green LED are kept unlit (0cd). At this time, the light-emitting brightness (1000cd) of the blue display

WHAT IS BEING CLAIMED:

1. A method for regulating light emitting diode (LED) of display device that consists of:
providing a multitude of LEDs, each composed of a multitude of red LEDs, a
5 multitude of green LEDs and a multitude of blue LEDs;
establishing a communication protocol to output corresponding driving current to
drive the LEDs emitting light, the communication protocol corresponding to a binary
coding, each binary coding respectively corresponding to the LEDs having different
light emitting colors;
10 allowing a light-emitting brightness of the blue LED to be 10% brightness during
white balance while simultaneously lighting the red LED, the green LED and the blue
LED to achieve the brightness at white balance, where if the red LED and the green
LED are at non-lighting state, a light-emitting brightness of the blue LED is further
enhanced to improve display effect, wherein, if the binary coding is a binary three-bit
15 coding and if the binary three-bit coding is “001”, then the red LED and the green
LED are retained at non-lighting states (0cd) to display pure blue images, and the
light-emitting brightness of the blue LED is increased to 120% the brightness emitted
at white balance.
2. The method for regulating light emitting diode (LED) of display device of claim 1,
20 where if the binary coding is a binary three-bit coding and the binary three-bit coding
is “000”, the red LED, the green LED and the blue LED remain unlit.
3. The method for regulating light emitting diode (LED) of display device of claim 1,
where if the binary coding is the binary three-bit coding and the binary three-bit
coding is “010”, the red LED and the blue LED remain unlit, and the light-emitting
25 brightness of the green LED equals the emitted brightness during white balance.
4. The method for regulating light emitting diode (LED) of display device of claim 1,

where if the binary coding is the binary three-bit coding and the binary three-bit coding is “011”, the red LED remains unlit, and the light-emitting brightness of the green LED and the light-emitting brightness of the blue LED equal the emitted brightness during white balance.

- 5 5. The method for regulating light emitting diode (LED) of display device of claim 1, where if the binary coding is the binary three-bit coding and the binary three-bit coding is “100”, the green LED and the blue LED are retained at non-lighting state, and the light-emitting brightness of the red LED equals the emitted brightness during white balance.
- 10 6. The method for regulating light emitting diode (LED) of display device of claim 1, when the binary coding is the binary three-bit coding and the binary three-bit coding is “101”, the green LED remains unlit, and the light-emitting brightness of the red LED and the light-emitting brightness of the blue LED equal the emitted brightness during white balance.
- 15 7. The method for regulating light emitting diode (LED) of display device of claim 1, where if the binary coding is the binary three-bit coding and the binary three-bit coding is “110”, the blue LED remains unlit, and the light-emitting brightness of the red LED and the light-emitting brightness of the green LED equal the emitted brightness during white balance.
- 20 8. The method for regulating light emitting diode (LED) of display device of claim 1, where if the binary coding is the binary three-bit coding and the binary three-bit coding is “111”, the light-emitting brightness of the red LED, the light-emitting brightness of the blue LED and the light-emitting brightness of the green LED equal the emitted brightness during white balance, and the displayed color is white.
- 25 9. The method for regulating light emitting diode (LED) of display device of claim 1,

wherein the light-emitting brightnesses of the red LED, the green LED and the blue LED can be controlled by pulse width modulation.