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(54) **TV SET, METHOD OF CONTROLLING  
BACKLIGHT OF LIQUID CRYSTAL PANEL  
AND STORAGE MEDIUM**

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(57) **ABSTRACT**

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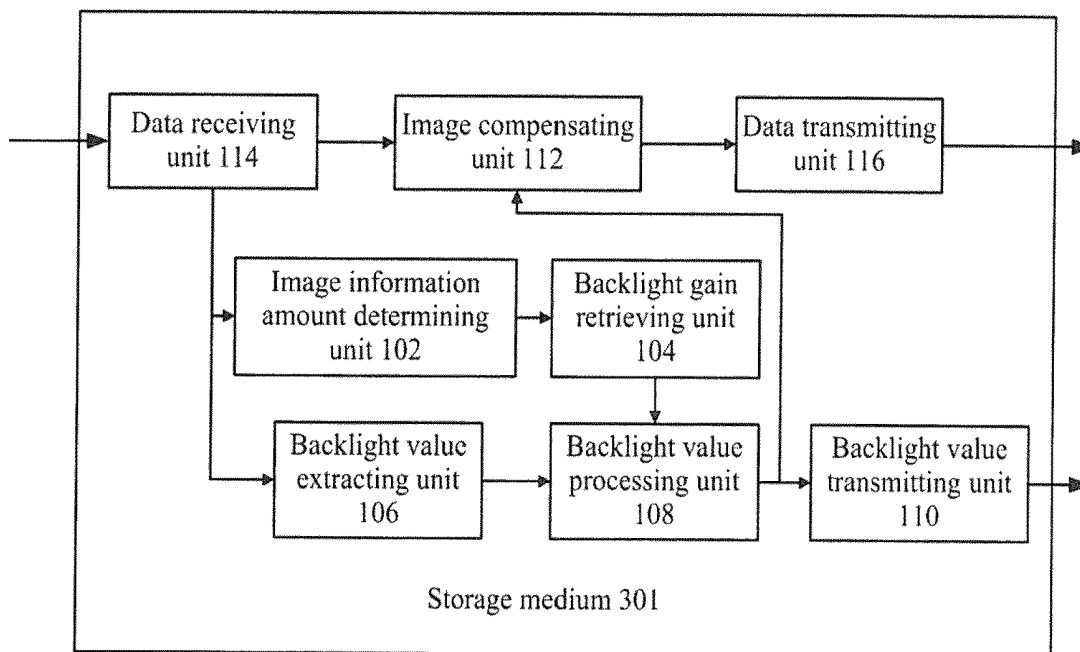
A TV set including a liquid crystal panel, a processor-readable storage medium storing instruction units for providing the TV set functions to control backlight of the liquid crystal panel; and one or more processors in communication with the storage medium to execute the instruction units, wherein the instruction units include: an image information amount determining unit (102); the backlight gain retrieving unit (104); a backlight value extracting unit (106); the backlight value processing unit (108); and a backlight value transmitting unit (110). Correspondingly a method of controlling backlight of a liquid crystal panel is further disclosed. In the technical solution of the disclosure, a backlight modulation coefficient can be modulated dynamically according to the amount of image information to perform backlight enhancement on an image with a large amount of information.

**Related U.S. Application Data**

(63) Continuation of application No. PCT/CN2012/079535, filed on Aug. 1, 2012.

**Foreign Application Priority Data**

(30) Apr. 17, 2012 (CN) ..... 201210112757.0



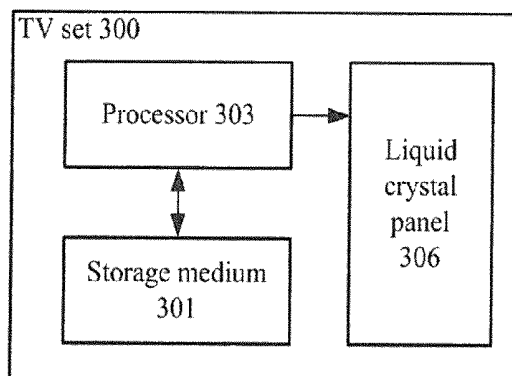


Fig.1

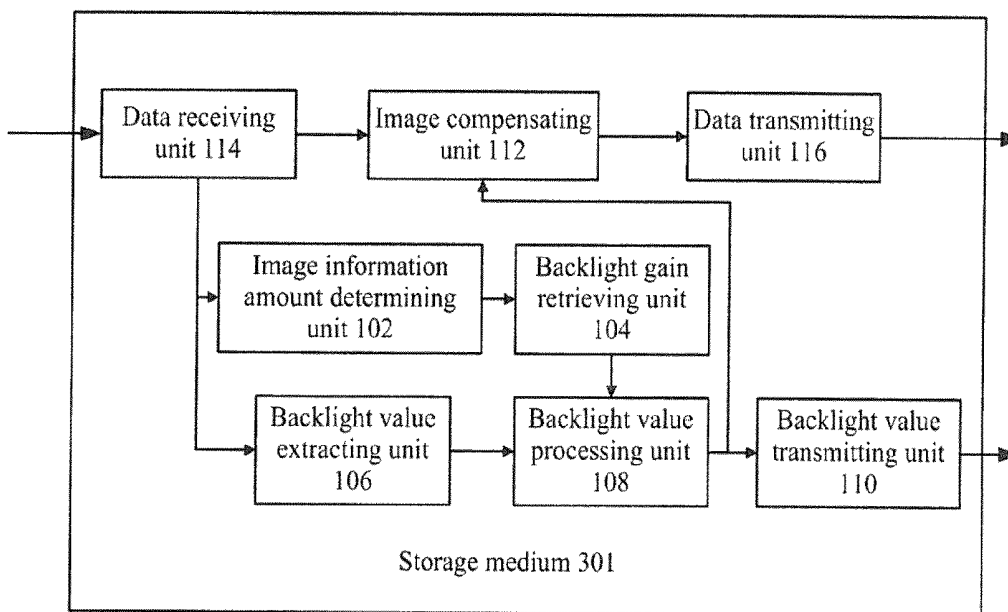


Fig.2

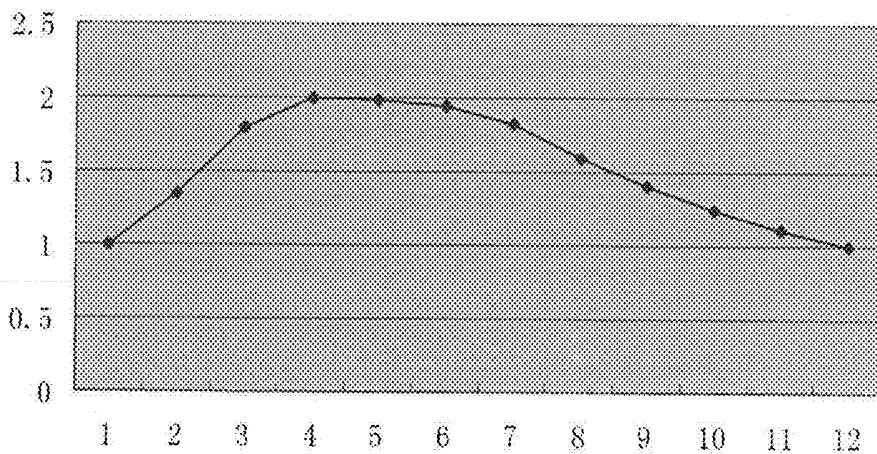


Fig.3A

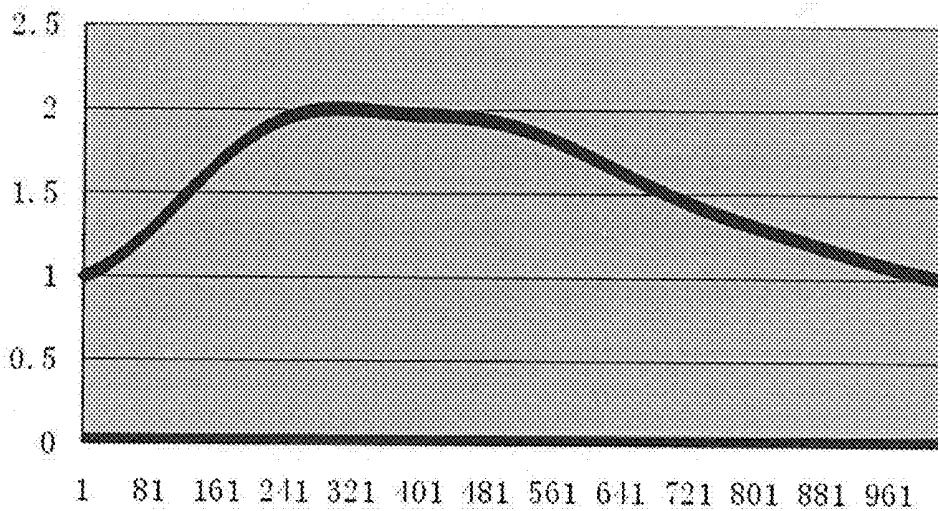


Fig.3B

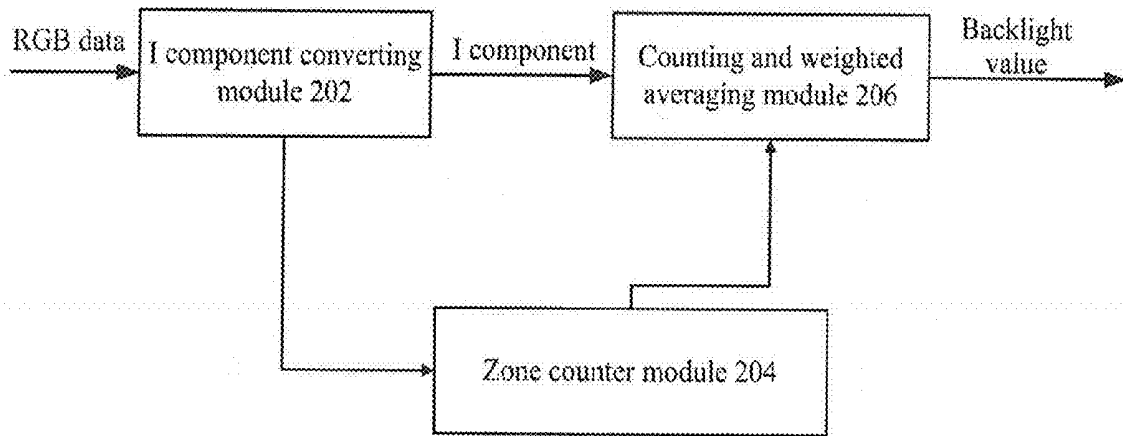


Fig.4

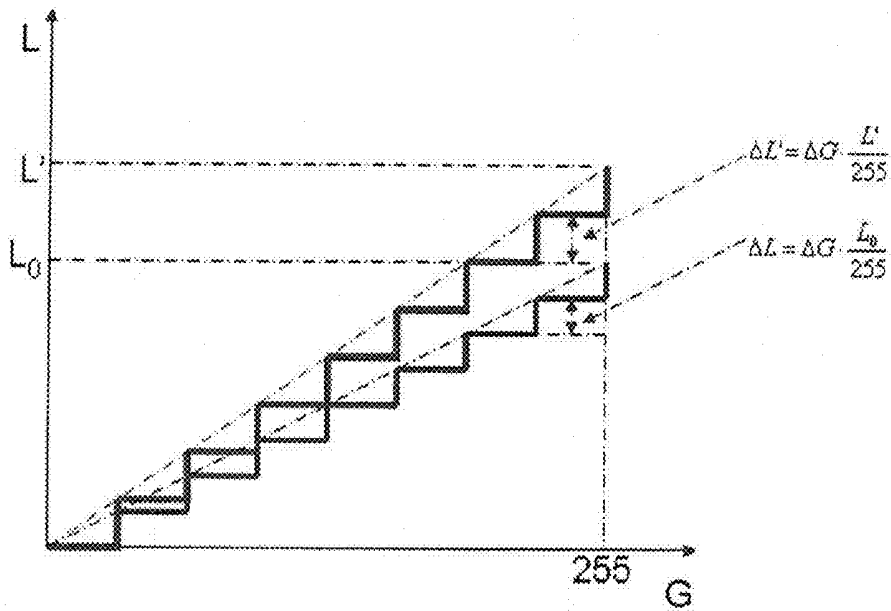


Fig.5

**TV SET, METHOD OF CONTROLLING  
BACKLIGHT OF LIQUID CRYSTAL PANEL  
AND STORAGE MEDIUM**

CROSS-REFERENCE TO RELATED  
APPLICATIONS

**[0001]** The present application claims priority to and is a continuation of international Patent Application PCT/CN2012/079535, which claims priority to Chinese Patent Application No. 201210112757.0, filed on Apr. 17, 2012 in the People's Republic of China, entitled "APPARATUS AND METHOD OF CONTROLLING BACKLIGHT OF LIQUID CRYSTAL PANEL, TV SET, MACHINE-READABLE PROGRAM AND STORAGE MEDIUM THEREOF", the contents of which is hereby incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

**[0002]** The present disclosure relates to the field of liquid crystal screen backlight modulation and particularly to an apparatus for controlling backlight of a liquid crystal panel, a TV set and a method of controlling backlight of a liquid crystal panel.

**[0003]** Internet TV, intelligent TV, etc., have constantly been coming into view of audiences along with constant development of TV technologies. But the visual effect of prior arts can not satisfy at least a part of the audiences.

BRIEF SUMMARY OF THE INVENTION

**[0004]** In view of this, the disclosure provides a TV set including a liquid crystal panel, a processor-readable storage medium storing instruction units for providing the TV set functions to control backlight of the liquid crystal panel; and one or more processors in communication with the storage medium to execute the instruction units, wherein the instruction units include: an image information amount determining unit configured to determine an amount of image information of an input video signal and to transmit the amount of image information to a backlight gain retrieving unit; the backlight gain retrieving unit, in communication with the image information amount determining unit, configured to retrieve a backlight gain coefficient according to the amount of image information; a backlight value extracting unit configured to extract a backlight value of the video signal and to transmit the backlight value to a backlight value processing unit; the backlight value processing unit, in communication with the backlight value extracting unit and the backlight gain retrieving unit, configured to calculate a gained backlight value from the backlight gain coefficient and the backlight value; and a backlight value transmitting unit, in communication with the backlight value processing unit, configured to transmit the gained backlight value to a light source drive circuit of a liquid crystal panel.

**[0005]** In the technical solutions above, preferably the backlight gain retrieving unit includes a memory configured to store amounts of image information and backlight gain coefficients in correspondence with each other, and the backlight gain retrieving unit is configured to search the memory for the backlight gain coefficient according to the amount of image information determined by the image information amount determining unit.

**[0006]** in the technical solutions above, preferably the backlight value processing unit is configured to calculate the

gained backlight value according to an equation of  $f(x)=k(\alpha)\times x$ , wherein  $f(x)$  represents the gained backlight value,  $\alpha$  represents the amount of image information,  $k(\alpha)$  represents the backlight gain coefficient, and  $x$  represents the backlight value extracted by the backlight value extracting unit.

**[0007]** In the technical solutions above, preferably the instruction units can further includes an image compensating unit, in communication with the backlight processing unit, configured to compensate the received video signal according to the received gained backlight value.

**[0008]** In the technical solutions above, preferably the instruction units can further includes a data receiving unit and a data transmitting unit, wherein the data receiving unit is in communication with the image information amount determining unit, the backlight value extracting unit and the image compensating unit, and the data transmitting unit is in communication with the image compensating unit, wherein the video signal is received from outside through the data receiving unit and the video signal compensated by the image compensating unit is transmitted to a timing control unit of the liquid crystal panel,

**[0009]** According to another aspect of the disclosure, there is further provided a method of controlling backlight of a liquid crystal panel, applicable to a terminal with an apparatus for controlling backlight of a liquid crystal panel, the method including: a step **202** of determining an amount of image information of an input video signal and extracting a backlight value of the video signal; a step **204** of retrieving a backlight gain coefficient according to the amount of image information; a step **206** of calculating a gained backlight value from the backlight gain coefficient and the backlight value; and a step **208** of transmitting the gained backlight value to a light source drive circuit of a liquid crystal panel to control backlight of the liquid crystal panel.

**[0010]** In the technical solutions above, preferably the step **204** includes: storing amounts of image information and backlight gain coefficients in correspondence with each other, and retrieving the backlight gain coefficient according to the determined amount of image information. In the technical solution, amounts of image information and backlight gain coefficients are created in correspondence with each other.

**[0011]** In the technical solutions above, preferably the method can further include a step **210** of compensating the received video signal according to the gained backlight value and then outputting the video signal to the liquid crystal panel.

**[0012]** In the technical solutions above, preferably in the step **206**, the gained backlight value) is calculated according to an equation of:  $f(x)=k(\alpha)\times x$  wherein  $f(x)$  represents the gained backlight value,  $\alpha$  represents the amount of image information,  $k(\alpha)$  represents the backlight gain coefficient, and  $x$  represents the extracted backlight value.

**[0013]** The disclosure further provide a storage medium storing a machine readable program to cause a machine to perform the method of controlling backlight of a liquid crystal panel as described in any one of the technical solutions above.

BRIEF DESCRIPTION OF THE DRAWINGS

**[0014]** FIG. 1 illustrates a block diagram of a TV set according to an embodiment of the disclosure;

**[0015]** FIG. 2 illustrates a block diagram of instruction units for controlling backlight of a liquid crystal panel according to an embodiment of the disclosure;

**[0016]** FIG. 3A illustrates a schematic diagram of a backlight gain lookup curve according to an embodiment of the disclosure;

**[0017]** FIG. 3B illustrates an improved schematic diagram of a backlight gain lookup curve according to an embodiment of the disclosure;

**[0018]** FIG. 4 illustrates a schematic diagram of extraction of a zone backlight value according to an embodiment of the disclosure; and

**[0019]** FIG. 5 illustrates a grayscale vs. brightness curve diagram according to an embodiment of the disclosure.

#### DETAILED DESCRIPTION OF THE INVENTION

**[0020]** In order to make the objects, features and advantages of the invention more apparent, the invention will be further described in details below with reference to the drawings and particular embodiments thereof.

**[0021]** Numerous details have been set forth in the following description for full understanding of the invention, but the invention can alternatively be embodied in other embodiments than those described here, so the scope of the invention shall not be limited to the particular embodiments disclosed below.

**[0022]** FIG. 1 illustrates a block diagram of a TV set according to an embodiment of the disclosure.

**[0023]** As illustrated in FIG. 1, the TV set 300 includes a liquid crystal panel 306, a processor-readable storage medium 301 storing instruction units for providing the TV set functions to control backlight of the liquid crystal panel; and one or more processors 303 in communication with the storage medium 301 to execute the instruction units.

**[0024]** FIG. 2 illustrates a block diagram of the instruction units for controlling backlight of a liquid crystal panel according to an embodiment of the disclosure.

**[0025]** As illustrated in FIG. 2, the instruction units for controlling backlight of a liquid crystal panel 100 according to the embodiment of the disclosure includes: an image information amount determining unit 102 configured to determine the amount of image information of an input Video signal (e.g., an image entropy and the size of a white image window) and to transmit the amount of image information to a backlight gain retrieving unit 104; the backlight gain retrieving unit 104, in communication with the image information amount determining unit 102, configured to retrieve a backlight gain coefficient according to the amount of image information; a backlight value extracting unit 106 configured to extract a backlight value of the video signal (reference can be made to FIG. 4 for a particular scheme to extract a backlight value) and to transmit the backlight value to a backlight value processing unit 108; the backlight value processing unit 108, in communication with the backlight value extracting unit 106 and the backlight gain retrieving unit 104, configured to calculate a gained backlight value from the backlight gain coefficient and the backlight value; and a backlight value transmitting unit 110, in communication with the backlight value processing unit 108, configured to transmit the gained backlight value to a light source drive circuit of a liquid crystal panel.

**[0026]** In an example, the amount of image information can be derived according to an equation of:

$$\alpha = \frac{1}{M \cdot N} \sum_{x=1}^M \sum_{y=1}^N \max(R(x, y), G(x, y), B(x, y))$$

for coordinates of a pixel  $(x, y) \in (1:M, 1:N)$ .

**[0027]** Where  $\alpha$  represents the amount of image information, M and N define boundaries of an image area, and R, G and B represent three color channels of red, green and blue respectively. The cumulative sum of the maximums of pixels R, G and B in a specific region of the image or the entire image on the screen is determined as the amount of image information thereof.

**[0028]** In the technical solution, the backlight value of the video signal is processed according to the retrieved backlight gain coefficient into a backlight value suitable for the corresponding image so that backlight enhancement can be performed on the image with a large amount of information and the difference in brightness between grayscales of the image with a large amount of information can be raised. As such the layered perception and the contrast of the displayed video can be improved effectively.

**[0029]** In the technical solution above, preferably the backlight gain retrieving unit 104 includes a memory (not illustrated) configured to store amounts of image information and backlight gain coefficients in correspondence with each other, and the backlight gain retrieving unit 104 is configured to search the memory for the backlight gain coefficient according to the amount of image information determined by the image information amount determining unit 102.

**[0030]** In the technical solution, amounts of image information and backlight gain coefficients are stored in correspondence with each other. As such a backlight gain coefficient lookup table can be created, the corresponding backlight gain coefficient is retrieved for the amount of image information, and correspondence relationship data in the backlight gain coefficient lookup table can be updated as needed in reality. Reference can be made to FIG. 3A and FIG. 3B for a particular scheme to retrieve a backlight gain coefficient.

**[0031]** In the technical solution above, preferably the backlight value processing unit is configured to calculate the gained backlight value according to an equation of  $f(x) = k(\alpha) \cdot x$ , where  $f(x)$  represents the gained backlight value,  $\alpha$  represents the amount of image information,  $k(\alpha)$  represents the backlight gain coefficient, and  $x$  represents the backlight value extracted by the backlight value extracting unit.

**[0032]** In the technical solution, the gained backlight value is the product of the backlight value and the backlight gain coefficient, and since an all-white field is taken as a modulation base point, a stronger backlight value can be derived from the amount of image information.

**[0033]** In the technical solution above, preferably the instruction units further includes an image compensating unit 112, in communication with the backlight processing unit 108, configured to compensate the received video signal according to the received gained backlight value.

**[0034]** In the technical solution, the image needs to be compensated due to a change to the backlight value so as to prevent an obvious change in brightness of the image.

**[0035]** In the technical solution above, preferably the instruction units can further include a data receiving unit 114

and a data transmitting unit 116, where the data receiving unit 114 is in communication with the image information amount determining unit 102, the backlight value extracting unit 106 and the image compensating unit 112, and the data transmitting unit 116 is in communication with the image compensating unit 112, wherein the video signal is received from outside through the data receiving unit 114 and the video signal compensated by the image compensating unit 112 is transmitted to a timing control unit of the liquid crystal panel.

[0036] In the technical solution, the video signal is received through the data receiving unit 114 (e.g., an LVDS receiver) and the processed video signal is outputted to a timing control unit of the liquid crystal panel through the data transmitting unit 116 (e.g., an LVDS transmitter).

[0037] With the technical solution above, the backlight modulation coefficient can be modulated dynamically according to the amount of image information to perform backlight enhancement on an image with a large amount of information and to raise the difference in brightness between grayscales of the image so as to improve effectively the layered perception and the contrast of the displayed video.

[0038] FIG. 3A and FIG. 3B illustrate schematic diagrams of a backlight gain lookup curve according to an embodiment of the disclosure

[0039] Firstly a reference is defined: an all-white field is typically taken as a reference defined as a modulation coefficient  $K_0$ . Backlight gain coefficients corresponding to respective amounts of image information can be, derived experimentally and as depicted in Table 1 below, the curve as illustrated in FIG. 3A can be plotted from the data in Table 1, where the abscissa represents the amount of image information and the ordinate represents a backlight gain coefficient in FIG. 3A.

TABLE 1

| Amount of image information | Backlight gain coefficient |
|-----------------------------|----------------------------|
| 1                           | 1                          |
| 2                           | 1.35                       |
| 3                           | 1.8                        |
| 4                           | 2                          |
| 5                           | 1.98                       |
| 6                           | 1.95                       |
| 7                           | 1.82                       |
| 8                           | 1.6                        |
| 9                           | 1.4                        |
| 10                          | 1.25                       |
| 11                          | 1.11                       |
| 12                          | 1                          |

[0040] Due to a limited amount of data that can be derived experimentally, the data in the table above can be interpolated into a higher amount of data, and FIG. 3B illustrates a fitting curve as a result of interpolation. Such data is stored in the memory of the backlight gain retrieving unit 104, and the backlight gain retrieving unit 104 can retrieve the backlight gain coefficient according to the amount of image information after the image information amount determining unit 102 determines the amount of image information.

[0041] A particular process of extracting a backlight value according to the disclosure will be described below with reference to FIG. 4. FIG. 4 illustrates a schematic diagram of extraction of a zone backlight value according to an embodiment of the disclosure.

[0042] As illustrated in FIG. 4, the backlight value extracting unit 106 generally includes three modules: an I-component converting module 202 for R/G/B color space to HSI color space conversion, a zone counter module 204 and a counting and weighted averaging module 206 for averages and maximums in zones. The I-component converting module 202 for R/G/B color space to HSI color space conversion is configured to convert input R/G/B image data into an I component in the HSI color space according to an equation of

$$I = \frac{R + G + B}{3},$$

where I, G and B are normalized.

[0043] Then the I-component converting module 202 for R/G/B color space to HSI color space conversion is configured to output the I component to the zone counter module 204 and the counting and weighted averaging module 206 for averages and maximums in zones respectively; the zone counter module 204 is configured to record the position of a zone where the component I is located and to provide the position to the counting and weighted averaging module 206 for averages and maximums in zones; and the counting and weighted averaging module 206 for averages and maximums in zones is configured to count the maximum and the average of each zone from information about the I component provided by the zone counter module 204. Finally the maximums and the averages of the zones are further weighted-averaged after backlight values of a frame of image data are counted.

[0044] (1) The I-component converting module 202 for R/G/B color space to HSI color space conversion:

[0045] A color model (also referred to as a color space) is used to simplify a color specification in a commonly acceptable manner in some standard. In digital image processing, a hardware-oriented model which is the most universal in practice is the RGB (red, green and blue) model. This model is used for a color monitor and a general category of color video cameras. The YUV (analog PAL) (brightness and chromatics R-Y and G-Y) or YCbCr (digital) color space is applied in a modern color TV set. The BSI (hue, saturation and intensity) model is more suitable for a person to describe and explain a color. The HSI color is selected to analyze and count a backlight value in view of the following two aspects: firstly the HSI space is more suitable for perception by human eyes, and if the WV space is used, then a backlight value counted from Y may come with the problem of a loss of blue details due to a low weight of blue converted into Y; and secondly an equation of an I component in R/G/B to HSI space conversion (see Equation 1) is simple and easy to implement

$$I = \frac{R + G + B}{3},$$

where I, G and B are normalized (Equation 1).

[0046] (2) The zone counter module 204:

[0047] It can be configured to divide an LED backlight source into nine zones, each of which is composed of four LEDs driven in series to adjust a bright grayscale separately. Each zone corresponds to pixels in a corresponding area of the liquid crystal panel so that the zone counter module records the position of a zone where the I component is located. Of course the number of zones, and the size and

shape of a zone may vary in practical applications. However substantially the same zoning mechanism will apply thereto.

**[0048]** (3) The counting and weighted averaging module 206 for averages and maximums in zones:

**[0049]** The counting and weighted averaging module 206 for averages and maximums in zones is configured to count the maximum and the average of each zone from the information about the I component provided by the zone counter module 204, where typically the counted maximums and averages are stored temporarily in two RAMs in a counting process. Finally the maximums and the averages of the zones are further weighted-averaged after the backlight values of a frame of image data are counted. Particular weight coefficients thereof can be determined according to a system test result.

**[0050]** The principle of the apparatus for controlling backlight of a liquid crystal panel has been described above in details, and a TV set according to the disclosure will be described below with reference to FIG. 4 illustrating a block diagram of a TV set according to an embodiment of the disclosure.

**[0051]** FIG. 5 illustrates a grayscale vs. brightness curve diagram according to an embodiment of the disclosure.

**[0052]** As illustrated in FIG. 5, there is illustrated an 8-bit black step curve. As illustrated, the abscissa G represents a grayscale, and the ordinate L represents a brightness value.  $L_0$  represents a brightness value corresponding to the highest grayscale 255 in a relevant backlight modulation technology, and the difference in brightness between grayscales is

$$\Delta L = \Delta G \cdot \frac{L_0}{255}.$$

**[0053]** With processing in the liquid crystal panel backlight control technology of the disclosure,  $L'$  represents the brightness of enhanced backlight corresponding to the highest grayscale in an image, and  $L' > L_0$  indicates significantly enhanced brightness of the image; and the difference in brightness between grayscales is

$$\Delta L' = \Delta G \cdot \frac{L'}{255}.$$

and  $\Delta L' > \Delta L$  indicates an increase in slope of the curve as compared with that prior to processing, which suggests a significant improvement of the layered perception and the contrast of the display image.

**[0054]** The technical solution of the disclosure has been described above in details with reference to the drawings, and in view of the impossibility in the prior art to achieve good layered perception and contrast for a large amount of image information in backlight modulation according to a cumulative brightness value of an image, the disclosure proposes a novel liquid crystal panel backlight control technology in which a backlight modulation coefficient can be modulated dynamically according to the amount of image information to perform backlight enhancement on an image with a large amount of information and to raise the difference in brightness between grayscales of the image so as to improve effectively the layered perception and the contrast of a displayed video.

**[0055]** The disclosure further provide a program product, stored on a non-transitory machine readable medium, for controlling backlight of a liquid crystal panel, the program product including machine executable instructions to cause a computer system to perform the steps of determining the amount of image information of an input video signal and extracting a backlight value of the video signal; retrieving a backlight gain coefficient according to the amount of image information; calculating a gained backlight value from the backlight gain coefficient and the backlight value; and transmitting the gained backlight value to a light source drive circuit of the liquid crystal panel to control backlight of the liquid crystal panel.

**[0056]** The disclosure further provide a non-transitory machine readable medium storing a program product for controlling backlight of a liquid crystal panel, the program product including machine executable instructions to cause a computer system to perform the steps of determining the amount of image information of an input video signal and extracting a backlight value of the video signal; retrieving a backlight gain coefficient according to the amount of image information; calculating a gained backlight value from the backlight gain coefficient and the backlight value; and transmitting the gained backlight value to a light source drive circuit of the liquid crystal panel to control backlight of the liquid crystal panel.

**[0057]** The disclosure further provide a machine readable program to cause a machine to perform the method of controlling backlight of a liquid crystal panel as described in any one of the technical solutions above.

**[0058]** The disclosure further provide a storage medium storing a machine readable program to cause a machine to perform the method of controlling backlight of a liquid crystal panel as described in any one of the technical solutions above.

**[0059]** In the disclosure, the terms “install”, “in communication”, “connect”, “fix”, etc., shall be interpreted broadly unless other stated and defined expressly, for example, they can relate to fixed connection or removable connection or integral connection; or can be mechanical connection or electrical connection; or can be direct connection or indirect connection via an intermediate medium; or can relate to two elements connected internal thereto. Those ordinarily skilled in the art can learn the particular meanings of the terms in the disclosure dependent upon a practical scenario.

**[0060]** The foregoing disclosure is merely illustrative of the preferred embodiments of the disclosure but not intended to limit the invention, and those skilled in the art can make various modifications and variations thereto. Any modifications, equivalent substitutions, adaptations, etc., made without departing from the spirit and the principle of the invention shall come into the scope of the invention.

1. A TV set, comprising:

a liquid crystal panel;

a processor-readable storage medium storing instruction units for providing the TV set functions to control backlight of the liquid crystal panel; and

one or more processors in communication with the storage medium to execute the instruction units,

wherein the instruction units comprise:

an image information amount determining unit configured to determine an amount of image information of a video signal inputted and to transmit the amount of image information to a backlight gain retrieving unit;

the backlight gain retrieving unit, in communication with the image information amount determining unit, configured to retrieve a backlight gain coefficient according to the amount of image information;

a backlight value extracting unit configured to extract a backlight value of the video signal and to transmit the backlight value to a backlight value processing unit;

the backlight value processing unit, in communication with the backlight value extracting unit and the backlight gain retrieving unit, configured to calculate a gained backlight value from the backlight gain coefficient and the backlight value; and

a backlight value transmitting unit, in communication with the backlight value processing unit, configured to transmit the gained backlight value to a light source drive circuit of the liquid crystal panel.

2. The TV set according to claim 1, wherein the backlight gain retrieving unit is configured to store amounts of image information and backlight gain coefficients in correspondence with each other to the processor-readable storage medium, and the backlight gain retrieving unit is configured to search the processor-readable storage medium for the backlight gain coefficient according to the amount of image information determined by the image information amount determining unit.

3. The TV set according to claim 1, wherein the backlight value processing unit is configured to calculate the gained backlight value according to an equation of  $f(x)=k(\alpha)\times x$ , wherein  $f(x)$  represents the gained backlight value,  $\alpha$  represents the amount of image information,  $k(\alpha)$  represents the backlight gain coefficient, and  $x$  represents the backlight value extracted by the backlight value extracting unit.

4. The TV set according to claim 1, wherein the instruction units further comprise:

an image compensating unit, in communication with the backlight processing unit, configured to compensate the video signal according to the gained backlight value.

5. The TV set according to claim 2, wherein the instruction units further comprise:

an image compensating unit, in communication with the backlight processing unit, configured to compensate the video signal according to the gained backlight value.

6. The TV set according to claim 3, wherein the instruction units further comprise:

an image compensating unit, in communication with the backlight processing unit, configured to compensate the video signal according to the gained backlight value.

7. The TV set according to claim 4, wherein the instruction units further comprise a data receiving unit and a data transmitting unit, wherein the data receiving unit, in communication with the image information amount determining unit, the backlight value extracting unit and the image compensating unit, is configured to receive the video signal from outside, and the data transmitting unit in communication with the image compensating unit is configured to transmit the video signal compensated by the image compensating unit to a timing control unit of the liquid crystal panel.

8. The TV set according to claim 5, wherein the instruction units further comprise a data receiving unit and a data transmitting unit, wherein the data receiving unit, in communication with the image information amount determining unit, the backlight value extracting unit and the image compensating unit, is configured to receive the video signal from outside, and the data transmitting unit in communication with the

image compensating unit is configured to transmit the video signal compensated by the image compensating unit to a timing control unit of the liquid crystal panel.

9. The TV set according to claim 6, wherein the instruction units further comprise a data receiving unit and a data transmitting unit, wherein the data receiving unit, in communication with the image information amount determining unit, the backlight value extracting unit and the image compensating unit, is configured to receive the video signal from outside, and the data transmitting unit in communication with the image compensating unit is configured to transmit the video signal compensated by the image compensating unit to a timing control unit of the liquid crystal panel.

10. A method of controlling backlight of a liquid crystal panel, comprising:

determining an amount of image information of a video signal inputted and extracting a backlight value of the video signal;

retrieving a backlight gain coefficient according to the amount of image information;

calculating a gained backlight value from the backlight gain coefficient and the backlight value; and

transmitting the gained backlight value to a light source drive circuit of the liquid crystal panel to control backlight of the liquid crystal panel.

11. The method according to claim 10, wherein the retrieving the backlight gain coefficient according to the amount of image information comprises: storing amounts of image information and backlight gain coefficients in correspondence with each other, and retrieving the backlight gain coefficient according to the determined amount of image information.

12. The method according to claim 10, further comprising: compensating the video signal according to the gained backlight value and then outputting to the liquid crystal panel.

13. The method according to claim 10, wherein the gained backlight value is calculated according to an equation of  $f(x)=k(\alpha)\times x$ , wherein  $f(x)$  represents the gained backlight value,  $\alpha$  represents the amount of image information,  $k(\alpha)$  represents the backlight gain coefficient, and  $x$  represents the extracted backlight value.

14. The method according to claim 11, wherein the gained backlight value is calculated according to an equation of  $f(x)=k(\alpha)\times x$ , wherein  $f(x)$  represents the gained backlight value,  $\alpha$  represents the amount of image information,  $k(\alpha)$  represents the backlight gain coefficient, and  $x$  represents the extracted backlight value.

15. The method according to claim 12, wherein the gained backlight value is calculated according to an equation  $f(x)=k(\alpha)\times x$ , wherein  $f(x)$  represents the gained backlight value,  $\alpha$  represents the amount of image information,  $k(\alpha)$  represents the backlight gain coefficient, and  $x$  represents the extracted backlight value.

16. A processor-readable storage medium, storing a set of instructions, wherein the set of instructions, when executed by one or more processors, cause the one or more processors to perform a method of controlling backlight of a liquid crystal panel, the method comprising:

determining an amount of image information of a video signal inputted and extracting a backlight value of the video signal;

retrieving a backlight gain coefficient according to the amount of image information;

calculating a gained backlight value from the backlight gain coefficient and the backlight value; and transmitting the gained backlight value to a light source drive circuit of the liquid crystal panel to control backlight of the liquid crystal panel.

17. The processor-readable storage medium according to claim 16, wherein the retrieving the backlight gain coefficient according to the amount of image information comprises: storing amounts of image information and backlight gain coefficients in correspondence with each other, and retrieving the backlight gain coefficient according to the determined amount of image information.

18. The processor-readable storage medium according to claim 16, the method further comprising:

compensating the video signal according to the gained backlight value and then outputting to the liquid crystal panel.

19. The processor-readable storage medium according to claim 16, wherein the gained backlight value is calculated according to an equation of  $f(x)=k(\alpha)\times x$ , wherein  $f(x)$  represents the gained backlight value,  $\alpha$  represents the amount of image information,  $k(\alpha)$  represents the backlight gain coefficient, and  $x$  represents the extracted backlight value.

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|----------------|--|---------|------------|
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#### 摘要(译)

一种电视机，包括液晶面板，存储指令单元的处理器可读存储介质，用于提供控制液晶面板的背光的电视机功能；一个或多个处理器与存储介质通信以执行指令单元，其中指令单元包括：图像信息量确定单元（102）；背光增益检索单元（104）；背光值提取单元（106）；背光值处理单元（108）；和背光值发送单元（110）。相应地，还公开了一种控制液晶面板背光的方法。在本发明的技术方案中，可以根据图像信息量动态调制背光调制系数，对具有大量信息的图像进行背光增强。

A TV set including a liquid crystal panel, a processor-readable storage medium storing instruction units for providing the TV set functions to control backlight of the liquid crystal panel; and one or more processors in communication with the storage medium to execute the instruction units, wherein the instruction units include: an image information amount determining unit (102); the backlight gain retrieving unit (104); a backlight value extracting unit (106); the backlight value processing unit (108); and a backlight value transmitting unit (110). Correspondingly a method of controlling backlight of a liquid crystal panel is further disclosed. In the technical solution of the disclosure, a backlight modulation coefficient can be modulated dynamically according to the amount of image information to perform backlight enhancement on an image with a large amount of information.