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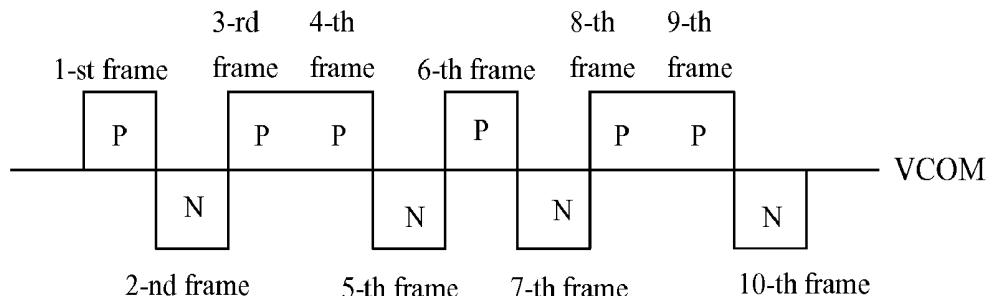
(19) **United States**(12) **Patent Application Publication**
CHEN(10) **Pub. No.: US 2017/0140721 A1**(43) **Pub. Date: May 18, 2017**(54) **DRIVING METHODS OF POLARITY
INVERSION OF LIQUID CRYSTAL PANELS****Publication Classification**(71) Applicant: **Shenzhen China Star Optoelectronics
Technology Co., Ltd.**, Shenzhen,
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G09G 3/36 (2006.01)(72) Inventor: **Lixuan CHEN**, Shenzhen, Guangdong
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CPC **G09G 3/3614** (2013.01); **G09G 3/3607**
(2013.01); **G09G 2310/0289** (2013.01); **G09G**
2310/0243 (2013.01)(73) Assignee: **Shenzhen China Star Optoelectronics
Technology Co., Ltd.**, Shenzhen,
Guangdong (CN)(57) **ABSTRACT**(21) Appl. No.: **14/778,923**(22) PCT Filed: **Aug. 31, 2015**(86) PCT No.: **PCT/CN2015/088515**

§ 371 (c)(1),

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A driving method of polarity inversion of liquid crystal panels includes driving sub-pixels within a predetermined area of the liquid crystal panel by a period having m number of consecutive frames, and m is an integer larger than four. Wherein polarity of sub-pixel driving voltage of a first predetermined number of consecutive frames among the m number of frames are the same, and the polarity of the sub-pixel driving voltage of the frames other than the first predetermined number of consecutive frames is opposite to the polarity of the sub-pixel driving voltage of the adjacent frames. With such configuration, the IS issue when displaying images by the liquid crystal panel may be eliminated.



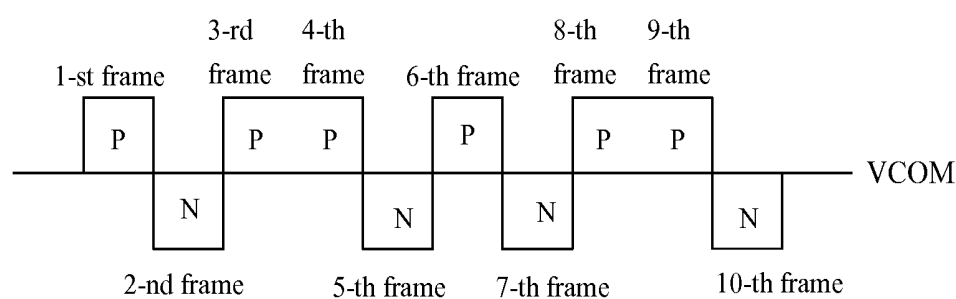


FIG. 1

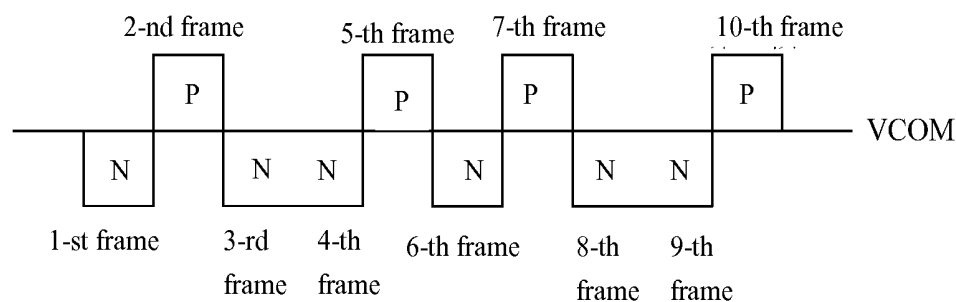


FIG. 2

DRIVING METHODS OF POLARITY INVERSION OF LIQUID CRYSTAL PANELS

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present disclosure relates to liquid crystal display technology, and more particularly to a driving method of polarity inversion of liquid crystal panels.

[0003] 2. Discussion of the Related Art

[0004] Image sticking (IS) a common issue on liquid crystal devices (LCDs). The liquid crystal molecules may be twisted due to the electrical field caused by direct current (DC), and then polar electrical fields are generated. This may cause biased DC, and may results in IS issue. Usually, the voltage driving methods of positive/negative polarity inversion are adopted to overcome this issue. However, as the material may cause pollution, inefficient manufacturing process, or other issues, the IS issue may still happen when static images have been displayed for a long period of time.

[0005] In addition, when the LCD is driven by the voltage driving method of positive/negative polarity inversion of a fixed common voltage (VCOM), as the positive voltage and the negative voltage of the VCOM of some locations are asymmetric, the liquid crystal panel may flicker. With respect to this issue, Multi-VCOM solution has been developed, and different VCOM are configured to drive different areas of the liquid crystal panel. However, the cost of adopting such technology is still high.

SUMMARY

[0006] In order to overcome the above problems, the present disclosure relates to a driving method of polarity inversion of liquid crystal panels for enhancing the IS issues when the liquid crystal panel displays the images.

[0007] In one aspect, a driving method of polarity inversion of liquid crystal panels includes:

[0008] driving sub-pixels within a predetermined area of the liquid crystal panel by a period having m number of consecutive frames, and m is an integer larger than four; and wherein polarity of sub-pixel driving voltage of a first predetermined number of consecutive frames among the m number of frames being the same, and the polarity of the sub-pixel driving voltage of the frames other than the first predetermined number of consecutive frames being opposite to the polarity of the sub-pixel driving voltage of the adjacent frames.

[0009] Wherein: when the first predetermined number is even, m is an odd number larger than the first predetermined number; and when the first predetermined number is odd, m is an even number larger than the first predetermined number.

[0010] Wherein the predetermined area is the whole area of the liquid crystal panel.

[0011] Wherein the predetermined area is one area within a plurality of areas of the liquid crystal panel.

[0012] Wherein the sub-pixels within another area of the plurality of areas of the liquid crystal panel are driven by the period having n number of consecutive frames, and n is an integer larger than four; and wherein the polarity of the sub-pixel driving voltage of the second predetermined number of consecutive frames among the n number of frames are the same, and the polarity of the sub-pixel driving voltage of the frames other than the second predetermined number of

consecutive frames is opposite to the polarity of the sub-pixel driving voltage of adjacent frames.

[0013] Wherein: when the second predetermined number is even, m is an odd number larger than the second predetermined number; and when the second predetermined number is odd, m is an even number larger than the second predetermined number.

[0014] Wherein when m equals with n , the polarity of the sub-pixel driving voltage of the i -th frame of the m number of the consecutive frames is opposite to the polarity of the sub-pixel driving voltage of the i -th frame of the n number of the consecutive frames, and wherein $i \in [1, m]$.

[0015] Wherein: under the condition that the first predetermined number is two and m equals 5 and the second predetermined number is two and m equals 5, the polarity of the sub-pixel driving voltage of the five consecutive frames within one area are positive, negative, positive, positive, and negative, and the polarity of the sub-pixel driving voltage of the five consecutive frames within another area may be negative, positive, negative, negative, and positive; or under the condition that the first predetermined number is two and m equals 5 and the second predetermined number is two and m equals 5, the polarity of the sub-pixel driving voltage of the five consecutive frames within one area are negative, positive, negative, negative, and positive, and the polarity of the sub-pixel driving voltage of the five consecutive frames within another area are positive, negative, positive, positive, and negative.

[0016] In view of the above, the driving method not only can eliminate the IS issue, but also can eliminate the flicker issue at the same time.

[0017] In order to further understand the characteristics of the invention as well as technical content, see the following detailed description of the present invention and the accompanying drawings, drawings, however, for reference purposes only and description of use is not intended to limit the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Below in conjunction with the accompanying drawings, through a specific embodiment of the present invention is described in detail, and will make apparent the technical solution of the present invention, and other beneficial effects.

[0019] FIG. 1 is a sectional view of the polarity change of a portion of frames of the driving voltage of the sub-pixel within an area among a plurality of areas of the liquid crystal panel in accordance with one embodiment.

[0020] FIG. 2 is a sectional view of the polarity change of a portion of frames of the driving voltage of the sub-pixel within another area among a plurality of areas of the liquid crystal panel in accordance with one embodiment.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0021] Embodiments of the invention will now be described more fully hereinafter with reference to the accompanying drawings, in which embodiments of the invention are shown.

[0022] In the embodiment, the driving method of the positive/negative polarity inversion of the liquid crystal panels may be adopted to drive sub-pixels within a predetermined area of the liquid crystal panel for a consecutive

period equaling to m number of frames. That is, the sub-pixels of the predetermined areas of the liquid crystal panel may be driven in accordance with the polarity of the sub-pixel driving voltage of each frame of the m number of frames recurrently. In an example, m is an integer larger than four.

[0023] Here, m is an integer larger than four. The polarity of the sub-pixel driving voltage of the first predetermined number of consecutive frames among the m number of frames are the same. The polarity of the sub-pixel driving voltage of the frames other than the first predetermined number of frames is opposite to the polarity of the sub-pixel driving voltage of the adjacent frames. Here, the liquid crystal panel may be any kind of liquid crystal panels. The first predetermined number of consecutive frames having the same polarity of the sub-pixel driving voltage may be arranged in any locations of the m number of frames. Preferably, the first predetermined number of consecutive frames may be arranged in the last frame of the m number of frames.

[0024] It can be understood that the first predetermined number is an integer larger than one. For instance, the first predetermined number may be two. That is, the first predetermined number may be configured accordingly. When the first predetermined number is even, m is an odd number larger than the first predetermined number. When the first predetermined number is odd, m is an even number larger than the first predetermined number. It can be understood that the value of m may be selected by experiments, or be calculated by theory.

[0025] The predetermined area may be a complete area of the liquid crystal panel. That is, all of the sub-pixels are driven by the same period, i.e., the same consecutive m number of frames, so as to become the driving method of the positive/negative polarity inversion in the embodiments.

[0026] In addition, the predetermined area may be one of the area among the plurality of areas of the liquid crystal panel. At this moment, the sub-pixels within other areas of the liquid crystal panel may be driven by other conventional areas.

[0027] In an example, the sub-pixels in another area of the liquid crystal panel may be driven by the period of consecutive n number of frames. Here, n is an integer larger than four. The polarity of the sub-pixel driving voltage of the second predetermined number of consecutive frames among then number of frames are the same. The polarity of the sub-pixel driving voltage of the frames other than the second predetermined number of consecutive frames is opposite to the polarity of the sub-pixel driving voltage of the adjacent frames.

[0028] The second predetermined number of consecutive frames having the same polarity of the sub-pixel driving voltage may be arranged in any locations of the m number of frames. Preferably, the first predetermined number of consecutive frames may be arranged in the last frame of the m number of frames.

[0029] It can be understood that the second predetermined number is an integer larger than one. For instance, the second predetermined number may be two. That is, the second predetermined number may be configured accordingly. When the second predetermined number is even, n is an odd number larger than the second predetermined number. When the second predetermined number is odd, n is an even number larger than the second predetermined number.

It can be understood that the value of m may be selected by experiments, or be calculated by theory.

[0030] Here, n may be equal to or different from m . The second predetermined number may be equal to or different from the first predetermined number. The location of the second predetermined number of consecutive frames having the same polarity of sub-pixel driving voltage may be arranged at the location among the n number of the frames that is the same with or different from that location of the first predetermined number of consecutive frames among the m number of the frames.

[0031] In an example, when m equals with n , the polarity of the sub-pixel driving voltage of the i -th frame of the m number of the consecutive frames is opposite to the polarity of the sub-pixel driving voltage of the i -th frame of the n number of the consecutive frames. Here, $i \in [1, m]$.

[0032] In other words, the polarity of the sub-pixel driving voltage of each of the frames of the n number of the consecutive frames is opposite to the polarity of the sub-pixel driving voltage of the corresponding frame of the m number of the consecutive frames.

[0033] For instance, under the condition that the first predetermined number is two and m equals 5 and the second predetermined number is two and m equals 5, the polarity of the sub-pixel driving voltage of five consecutive frames within one area may be positive, negative, positive, positive, and negative, as shown in FIG. 1. The polarity of the sub-pixel driving voltage of five consecutive frames within another area may be negative, positive, negative, negative, and positive, as shown in FIG. 1.

[0034] FIG. 1 is a sectional view of the polarity change of a portion of frames of the driving voltage of the sub-pixel within an area among a plurality of areas of the liquid crystal panel in accordance with one embodiment. In FIG. 1, only the polarity of the sub-pixel driving voltage of each frame for 10 frames, that is, two periods. It can be understood that the present disclosure is not limited to the above example. As shown in FIG. 1, the polarity of the sub-pixel driving voltage above the VCOM line is positive, and the polarity of the sub-pixel driving voltage below the VCOM line is negative.

[0035] FIG. 2 is a sectional view of the polarity change of a portion of frames of the driving voltage of the sub-pixel within another area among a plurality of areas of the liquid crystal panel in accordance with one embodiment. In FIG. 2, only the polarity of the sub-pixel driving voltage of each frame for 10 frames, that is, two periods. It can be understood that the present disclosure is not limited to the above example. As shown in FIG. 2, the polarity of the sub-pixel driving voltage above the VCOM line is positive, and the polarity of the sub-pixel driving voltage below the VCOM line is negative.

[0036] In addition, under the condition that the first predetermined number is two and m equals 5 and the second predetermined number is two and m equals 5, the polarity of the sub-pixel driving voltage of five consecutive frames within one area may be negative, positive, negative, negative, and positive. The polarity of the sub-pixel driving voltage of five consecutive frames within another area may be positive, negative, positive, positive, and negative.

[0037] It can be understood that other areas except for the above areas of the liquid crystal panel may be driven by other conventional driving methods basing on the real scenarios. When the plurality of the areas means two areas,

one of the area includes the sub-pixels in the odd rows of the liquid crystal panel, and “another area” means the sub-pixels in the even rows of the liquid crystal panel, wherein the row inversion driving method is implemented.

[0038] When the plurality of the areas means two areas, one of the area includes the sub-pixels having an odd sum of the row number and the column number, and “another area” includes the sub-pixels having an even sum of the row number and the column number, wherein the row inversion driving method is implemented.

[0039] When the plurality of the areas means two areas, one of the area includes the sub-pixels in the odd columns of the liquid crystal panel, and “another area” means the sub-pixels in the even columns of the liquid crystal panel, wherein the column inversion driving method is implemented.

[0040] In view of the above, by adding a predetermined number of frames having positive or negative driving voltage within one period to compensate the biased DC caused by various reasons. In this way, the IS issue may be overcome. In addition, the flicker issue may also be overcome by driving the different areas with different periods and polarity.

[0041] It is believed that the present embodiments and their advantages will be understood from the foregoing description, and it will be apparent that various changes may be made thereto without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the examples hereinbefore described merely being preferred or exemplary embodiments of the invention.

What is claimed is:

1. A driving method of polarity inversion of liquid crystal panels, comprising:

driving sub-pixels within a predetermined area of the liquid crystal panel by a period having m number of consecutive frames, and m is an integer larger than four; and

wherein polarity of sub-pixel driving voltage of a first predetermined number of consecutive frames among the m number of frames being the same, and the polarity of the sub-pixel driving voltage of the frames other than the first predetermined number of consecutive frames being opposite to the polarity of the sub-pixel driving voltage of the adjacent frames.

2. The driving method as claimed in claim 1, wherein: when the first predetermined number is even, m is an odd number larger than the first predetermined number; and when the first predetermined number is odd, m is an even number larger than the first predetermined number.

3. The driving method as claimed in claim 2, wherein the predetermined area is the whole area of the liquid crystal panel.

4. The driving method as claimed in claim 2, wherein the predetermined area is one area within a plurality of areas of the liquid crystal panel.

5. The driving method as claimed in claim 4, wherein the sub-pixels within another area of the plurality of areas of the liquid crystal panel are driven by the period having n number of consecutive frames, and n is an integer larger than four; and

wherein the polarity of the sub-pixel driving voltage of the second predetermined number of consecutive frames among the n number of frames are the same, and the polarity of the sub-pixel driving voltage of the frames other than the second predetermined number of consecutive frames is opposite to the polarity of the sub-pixel driving voltage of adjacent frames.

6. The driving method as claimed in claim 5, wherein: when the second predetermined number is even, m is an odd number larger than the second predetermined number; and

when the second predetermined number is odd, m is an even number larger than the second predetermined number.

7. The driving method as claimed in claim 6, wherein when m equals with n, the polarity of the sub-pixel driving voltage of the i-th frame of the m number of the consecutive frames is opposite to the polarity of the sub-pixel driving voltage of the i-th frame of the n number of the consecutive frames, and wherein $i \in [1, m]$.

8. The driving method as claimed in claim 7, wherein:

under the condition that the first predetermined number is two and m equals 5 and the second predetermined number is two and m equals 5, the polarity of the sub-pixel driving voltage of the five consecutive frames within one area are positive, negative, positive, positive, and negative, and the polarity of the sub-pixel driving voltage of the five consecutive frames within another area may be negative, positive, negative, negative, and positive; or

under the condition that the first predetermined number is two and m equals 5 and the second predetermined number is two and m equals 5, the polarity of the sub-pixel driving voltage of the five consecutive frames within one area are negative, positive, negative, negative, and positive, and the polarity of the sub-pixel driving voltage of the five consecutive frames within another area are positive, negative, positive, positive, and negative.

* * * * *

专利名称(译)	液晶面板极性反转的驱动方法		
公开(公告)号	US20170140721A1	公开(公告)日	2017-05-18
申请号	US14/778923	申请日	2015-08-31
[标]申请(专利权)人(译)	深圳市华星光电技术有限公司		
申请(专利权)人(译)	深圳市中国星光电科技有限公司.		
当前申请(专利权)人(译)	深圳市中国星光电科技有限公司		
[标]发明人	CHEN LIXUAN		
发明人	CHEN, LIXUAN		
IPC分类号	G09G3/36		
CPC分类号	G09G3/3614 G09G2310/0243 G09G2310/0289 G09G3/3607 G09G3/3666 G09G2340/16		
优先权	201510344787.8 2015-06-19 CN		
其他公开文献	US9972258		
外部链接	Espacenet USPTO		

摘要(译)

一种液晶面板的极性反转的驱动方法包括：在具有m个连续帧的周期内驱动液晶面板的预定区域内的子像素，并且m是大于四的整数。其中，m个帧中的第一预定数量的连续帧的子像素驱动电压的极性相同，并且除了第一预定数量的连续帧之外的帧的子像素驱动电压的极性相反相邻帧的子像素驱动电压的极性。利用这种配置，可以消除在通过液晶面板显示图像时的IS问题。

