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### Splicing screen display device

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#### Abstract

The present application discloses a display device and electronic device. The display device is configured by sequentially configuring the corresponding first bias current, second bias current, and third bias in a start period, a sustain period, and an end period. The current value of the first bias current is greater than the current value of the second bias current, and/or the current value of the third bias current is greater than the current value of the second bias current, which improves the display quality and reduces display power consumption.

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## References Cited

### U.S. PATENT DOCUMENTS

Patent No.	Issued Date	Patentee Name	U.S. Cl.	CPC
2011/0109526	12/2010	Bauza et al.	N/A	N/A
2016/0179453	12/2015	Jepsen	345/1.3	G06F 3/1446
2016/0267860	12/2015	Liu	N/A	G09G 3/32
2018/0018931	12/2017	Zhang	N/A	G09G 5/397
2021/0109389	12/2020	Fan	N/A	G02F 1/1362
2022/0013064	12/2021	Chang	N/A	G09G 3/006
2022/0343831	12/2021	Li	N/A	G09G 3/3666
2022/0365738	12/2021	Li	N/A	G09G 3/32

### FOREIGN PATENT DOCUMENTS

Patent No.	Application Date	Country	CPC
102708840	12/2011	CN	G09F 9/3026
103985371	12/2013	CN	N/A
104361837	12/2014	CN	N/A
106373493	12/2016	CN	N/A
208384939	12/2018	CN	N/A
111506284	12/2019	CN	N/A
113496686	12/2020	CN	N/A
20200089385	12/2019	KR	N/A
2012036081	12/2011	WO	N/A

## OTHER PUBLICATIONS

Chinese Office Action in corresponding Chinese Patent Application No. 202111324275.7 dated Dec. 28, 2021, pp. 1-8. cited by applicant

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## Background/Summary

### BACKGROUND OF INVENTION

#### Field of Invention

(1) The present disclosure relates to the field of display, in particular to a splicing screen display device.

#### Description of Prior Art

(2) With development of electronics industry, demands for various super-large-sized display devices are increasing day by day, and applications in various scenarios are becoming more and more extensive. Therefore, splicing screen display devices such as liquid crystal display (LCD) splicing screen display devices also getting more and more attention. In the splicing screen display devices, multiple LCD display screens may be spliced to form a super-sized display screen for image display according to actual display needs, which have advantages of clear image display and high flexibility.

(3) At present, since the splicing screen display device integrates a variety of different types of display modules, various functional elements that are matched with the display module are arranged inside the splicing screen display device, resulting in insufficient internal space of the device.

### SUMMARY OF INVENTION

(4) Embodiments of the present disclosure provide a splicing screen display device, which can solve the technical problem of insufficient internal space caused by too many integrated components in the splicing screen display device in the prior art.

(5) An embodiment of the present disclosure provides a splicing screen display device, and the splicing screen display device includes:

(6) display modules including a plurality of basic display modules and at least one supplementary display module, wherein the supplementary display module is disposed at a joint of two of the basic display modules;

(7) a processing module connected to the display modules with electrical signals and configured to perform a first process on a received source image frame to obtain a target sub-image frame corresponding to each of the display modules;

(8) a transmitting module connected to the processing module with electrical signals and configured to receive and perform a second process on a target sub-supplemental image frame transmitted by the processing module, wherein the target sub-supplemental image frame is the target sub-image frame corresponding to the supplementary display module; and

(9) a driving module disposed corresponding to the supplementary display module, and connected to the transmitting module and the supplementary display module with electrical signals, wherein the driving module includes a substrate, and a driving unit and a distribution unit integrated on the substrate, the driving unit is connected to the distribution unit with electrical signals, the driving unit is configured to perform a third process on the received target sub-supplemental image frame and transmit the received target sub-supplemental image frame to the distribution unit; and wherein the distribution unit is connected to the supplementary display module with electrical signals, and the distribution unit is configured to receive the target sub-supplementary image frame processed by the driving unit and distributes the target sub-supplementary image frame to a corresponding one of the supplementary display module for the supplementary display module to display.

- (10) In some embodiments of the present disclosure, the driving module further includes:
- (11) a port unit connected to the driving unit and the transmitting module with electrical signals and configured to receive the target sub-supplemental image frame transmitted by the transmitting module, and transmit the target sub-supplemental image frame to the driving unit.
- (12) In some embodiments of the present disclosure, the supplementary display module includes a plurality of supplementary display units, and the distribution unit correspondingly includes a plurality of display connectors, the display connectors are disposed on a same side, and the display connectors are docked and fixed to a corresponding one of the supplementary display units to realize electrical signal connection.
- (13) In some embodiments of the present disclosure, the driving module includes a driving board, and the driving board includes the substrate, and the port unit, the driving unit, and the distribution unit disposed on the substrate.
- (14) In some embodiments of the present disclosure, the driving board includes: a main driving board including the substrate, the port unit, the driving unit, the distribution unit, and an expansion connector; and an auxiliary driving board disposed at one side of the main driving board along the joint, and including the substrate, the distribution unit, and the expansion connector, wherein the main driving board is docked and fixed to the auxiliary driving board through the expansion connector to realize electrical signal connection, and the driving board further includes the port unit, the driving unit.
- (15) In some embodiments of the present disclosure, after receiving the target sub-supplemental image, and after the third process is performed through the driving unit on the main driving board, the target sub-supplemental image is converted into an image signal that can be displayed by each of the supplementary display unit, the image signal is correspondingly distributed to the display interface on the supplementary display unit, and the supplementary display unit is made to display through the display interface
- (16) In some embodiments of the present disclosure, the main driving board transmits a processed image signal to the auxiliary driving board through the expansion interface, the processed image signal is distributed to each of the display interfaces on the auxiliary driving board, so that the supplementary display unit docked on the auxiliary drive board also displays
- (17) In some embodiments of the present disclosure, the display connectors are disposed at one side of the substrate along the joint, and the expansion connector is disposed on the substrate at another side of the substrate adjacent to the side where the display connectors are disposed at.
- (18) In some embodiments of the present disclosure, the supplementary display units are disposed in strips along the joint, a border width of each of the supplementary display units is less than 5 mm, and a pixel width of each of the display units is greater than a sum of widths of 8 pixels.
- (19) In some embodiments of the present disclosure, a distance between adjacent ones of pixels of adjacent ones of the supplementary display units is less than 0.63 mm.
- (20) In some embodiments of the present disclosure, the driving module includes a plurality of driving submodules, each of the driving submodules includes a main driving submodule and an auxiliary driving submodule disposed at one side of the main driving submodule along the joint, and the main driving submodule transmits the target sub-supplemental image to the auxiliary driving sub-module.
- (21) In some embodiments of the present disclosure, the port unit is disposed on each of the main driving submodule and the auxiliary driving submodule, and the port unit includes a receiving port and a transmitting port;
- (22) wherein the receiving port of the main driving submodule is a main receiving port, the receiving port of the auxiliary driving submodule is an auxiliary receiving port, and the transmitting port of the main driving submodule is a main transmitting port; and
- (23) wherein the main receiving port is connected to the transmitting module with electrical signals and configured to receive the target sub-supplemental image frame transmitted by the transmitting

module, the main transmitting port is connected to the main receiving port and the auxiliary receiving port with electrical signals and configured to transmit the target sub-supplementary image frame received by the main receiving port to the auxiliary receiving port.

(24) In some embodiments of the present disclosure, a number of auxiliary driving submodules is multiple, and the main driving submodule and each of the auxiliary driving submodules are connected by cascade connection.

(25) In some embodiments of the present disclosure, the main driving submodule and each of the auxiliary driving submodules are arranged in sequence along the joint.

(26) In some embodiments of the present disclosure, the driving submodule includes at least one driving board, and the at least one driving board includes: a main driving board including the substrate, the port unit, the driving unit, the distribution unit, and an expansion connector; an auxiliary driving board disposed at one side of the main driving board along the joint, and including the substrate, the distribution unit, and the expansion connector, wherein the main driving board is docked and fixed to the auxiliary driving board through the expansion connector to realize electrical signal connection.

(27) In some embodiments of the present disclosure, the supplementary display module includes a plurality of supplementary display submodules corresponding to the main driving submodule and the auxiliary driving submodules, and each of the main driving submodule and the auxiliary driving submodules is respectively correspondingly connected to the supplementary display submodules with electrical signals

(28) In some embodiments of the present disclosure, each supplementary display submodule correspondingly includes a plurality of supplementary display units.

(29) In some embodiments of the present disclosure, the processing module includes:

(30) a receiving submodule configured to obtain the source image frame and a resolution information of the splicing screen display device, wherein the resolution information includes a pixel width of the supplementary display module, and the pixel width is a pixel size of the supplementary display module at the joint in a width direction;

(31) a processing submodule configured to add a border display area at an outer side of the source image frame and split the source image frame to form the target sub-image frame corresponding to each of the display modules, wherein the border display area is parallel to the joint, and a sum of pixel widths of the border display area that are parallel to each other is equal to a sum of pixel widths of the supplementary display module that are parallel to each other; and

(32) a transmitting submodule configured to transmit each of the target sub-image frame to a corresponding one of the display modules for display.

(33) In some embodiments of the present disclosure, the splicing screen display device is a display screen formed by a plurality of basic display modules arranged in a straight line, and the border display area is arranged at least one outer side of the source image frame parallel to the joint.

(34) In some embodiments of the present disclosure, the splicing screen display device is a display screen constituted by a plurality of basic display modules arranged in a rectangular array, and the border display area is arranged at the adjacent two of the outer sides of the source image frame.

(35) In the embodiments of the present disclosure, a driver card responsible for converting the received signal into an image that the display module can display in the driving module is converted into a driving unit, while a distribution card responsible for distributing the source image frame to the display unit is converted into a distribution unit, and then, the driving unit and the distribution unit are integrated on a substrate, to effectively save a space in the display device and solve the technical problem of insufficient internal space of the device caused by too many integrated components in the splicing screen display device. Meanwhile, the integration of the driving unit and the distribution unit also effectively shortens the time of information transmission, which can further ensure synchronization of display images of each of the display modules.

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## Description

### BRIEF DESCRIPTION OF DRAWINGS

- (1) In order to more clearly illustrate the embodiments or the technical solutions of the existing art, the drawings illustrating the embodiments or the existing art will be briefly described below. Obviously, the drawings in the following description merely illustrate some embodiments of the present invention. Other drawings may also be obtained by those skilled in the art according to these figures without paying creative work.
- (2) FIG. 1 is a schematic structural diagram of a splicing screen display device provided by an embodiment of the present disclosure.
- (3) FIG. 2 is a schematic diagram of image changes in an embodiment of the splicing screen display device according to the embodiment corresponding to FIG. 1.
- (4) FIG. 3 is a schematic diagram of image changes in another embodiment of the splicing screen display device according to the embodiment corresponding to FIG. 1.
- (5) FIG. 4 is a schematic diagram of the architecture of a driving module provided by an embodiment of the present disclosure.
- (6) FIG. 5 is a schematic structural diagram of a driving module provided by an embodiment of the present disclosure.
- (7) FIG. 6 is a schematic structural diagram of a driving submodule provided by an embodiment of the present disclosure.
- (8) FIG. 7 is a schematic structural diagram of a main driving board provided by an embodiment of the present disclosure.
- (9) FIG. 8 is a schematic diagram of a partial structure of a supplementary display unit provided by an embodiment of the present disclosure.
- (10) Elements in the drawings are designated by reference numerals listed below.
- (11) **100**, display module; **110**, basic display module; **120**, supplementary display module; **121**, supplementary display submodule; **1211**, supplementary display unit; **130**, joint; **200**, processing module; **210**, receiving submodule; **220**, processing submodule; **230**, transmitting submodule; **300**, transmitting module; **400**, driving module; **410**, port unit; **420**, driving unit; **430**, distribution unit; **440**, substrate; **450**, expansion interface; **401**, main driving submodule; **402**, auxiliary driving submodule; **403**, main driving board; **404**, auxiliary driving board; **411**, main receiving port; **412**, main transmitting port; **413**, auxiliary receiving port; **414**, auxiliary transmitting port; **431**, display interface; **800**, source image frame; **910**, target sub-image frame; **920**, border display area; **911**, sub-basic image frame; **912**, target sub-supplementary image frame.

### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

- (12) The technical solutions in the embodiments of the present application will be clearly and completely described in the following with reference to the accompanying drawings in the embodiments. It is apparent that the described embodiments are only a part of the embodiments of the present application, and not all of them. All other embodiments obtained by a person skilled in the art based on the embodiments of the present application without creative efforts are within the scope of the present application. In addition, it should be understood that the specific implementations described here are only used to illustrate and explain the application, and are not used to limit the application. In the present application, unless otherwise stated, the orientation words used such as “upper” and “lower” generally refer to the upper and lower directions of the device in actual use or working state, and specifically refer to the drawing directions in the drawings, while “inner” and “outer” refer to the outline of the device.
- (13) Embodiments of the present disclosure provide a spliced image frame display device and a spliced image frame display method, which are described in details below. It should be noted that the order of description in the following embodiments is not meant to limit a preferred order of the

embodiments.

(14) The present disclosure provides a splicing screen display device, which can be applied to various indoor and outdoor super-large splicing screen display devices and various other devices that require a display interface.

(15) Referring to FIGS. 1 to 3, the splicing screen display device includes a display module **100**, a processing module **200**, a transmitting module **300**, and a driving module **400**. The display module **100** includes a plurality of basic display modules **110** and at least one supplementary display module **120**, and the supplementary display module **120** is disposed at a joint **130** of two of the basic display modules **110**. The multiple basic display modules **110** can be arranged in a straight line to form a display screen with a larger screen-to-body ratio. The supplementary display module **120** is arranged at the joint **130** of adjacent ones of the basic display modules **110**. This arrangement is suitable for scenes that require a wider field of vision, such as movie theaters, game halls, control centers, etc., and for scenes that have certain requirements on the width or height of the display screen, such as outdoor advertisements and so on. The basic display modules **110** can also be arranged in a matrix array to form a display screen with a normal screen-to-body ratio. The supplementary display module **120** is arranged at the joint **130** of adjacent ones of the basic display modules **110**. This arrangement is suitable for scenes such as dispatching centers, indoor advertisements, outdoor advertisements, and so on.

(16) The processing module **200** is connected to the display module **100** with electrical signals, and is configured to perform a first process on a received source image frame **800** to obtain a target sub-image frame **910** corresponding to each of the display modules **100**, which includes the target sub-basic image frame **911** corresponding to the basic display module **110** and the target sub-supplementary image frame **912** corresponding to the supplementary display module **120**. The transmitting module **300** is connected to the processing module **200** with electrical signals to receive the target sub-supplemental image frame **912** transmitted by the processing module **200** and perform a second process. The target sub-supplemental image frame **912** is the target sub-image frame **910** corresponding to the supplementary display module **120**. The driving module **400** is disposed corresponding to the supplementary display module **120**, and connected to the transmitting module **300** and the supplementary display module **120** with electrical signals, and configured to receive the target sub-supplemental image frame **912** transmitted by the transmitting module **300**, and transmits the target sub-supplemental image frame **912** to the corresponding supplementary display module **120** after performing the third process.

(17) The first process is to split the source image frame **800** into a target sub-basic image frame **911** corresponding to the basic display module **110**, and a target sub-supplementary image frame **912** corresponding to the supplementary display module **120**, and perform corresponding optimization of image quality; the second process is to further optimize the image quality of the target sub-supplemental image **912** accordingly; and the third process is to convert the received target sub-image **910** into a signal that can be displayed by the supplementary display module **120**.

(18) That is, in this embodiment, after the processing module **200** receives the source image frame **800**, the first process is performed on the source image frame **800** to obtain the target sub-basic image frame **911** corresponding to the basic display module **110** and the target sub-supplementary image frame **912** corresponding to the supplementary display module **120**, the target sub-basic image frame **911** is transmitted to the corresponding driver to drive the basic display module **110** for display, the target sub-supplemental image frame **912** is transmitted to the transmitting module **300**, and then the transmitting module **300** performs the second process on the target sub-supplemental image frame **912**, and then transmits the target sub-supplemental image frame **912** to the driving module **400** corresponding to the supplementary display module **120** to drive the supplementary display module **120** to display the corresponding image frame.

(19) In some embodiments of the present disclosure, the processing module **200** includes a receiving submodule **210**, a processing submodule **220**, and a transmitting submodule **230**.

(20) The processing submodule **220** obtains a resolution information of the source image frame **800** and the splicing screen display device through the receiving submodule **210**; then adds a border display area **920** at an outer side of the source image frame **800** and split the source image frame **800** to form the target sub-image frame **910** corresponding to each of the display modules **100**; and finally transmits the target sub-image frame **910** to the corresponding display module **100** through the transmitting submodule **230** for display.

(21) The resolution information includes a pixel width of the supplementary display module **120**, and the pixel width is a pixel size of the supplementary display module **120** at the joint **130** in a width direction. The border display area **920** is parallel to the joint **130**, and a sum of pixel widths of the border display area **920** that are parallel to each other is equal to a sum of pixel widths of the supplementary display module **120** that are parallel to each other. The target sub-image frame **910** includes a target sub-basic image frame **911** corresponding to the basic display module **110** and a target sub-supplementary image frame **912** corresponding to the supplementary display module **120**.

(22) In this embodiment, specific execution steps of the above-mentioned first process are to first obtain the resolution information of the source image frame **800** and the splicing screen display device. The resolution information includes the pixel width of each supplementary display module **120**, and the pixel width is the pixel size of the supplementary display module **120** at the joint **130** in the width direction. Then, a border display area **920** is added at an outer side of the source image frame **800** to form the target sub-image frame **910** corresponding to each of the display modules **100**; wherein the border display area **920** is parallel to the joint **130**, and the border display area **920** is parallel to each other. The sum of pixel widths of the border display area **920** that are parallel to each other is equal to the sum of pixel widths of the supplementary display module **120** that are parallel to each other. Finally, each of the target sub-image frame **910** is transmitted to the corresponding display module **100** for display.

(23) If there is a need to display an image frame on the splicing screen, it is necessary to first obtain the corresponding source image frame **800** and the relevant resolution information of the corresponding splicing screen display device in order to pre-process the image frame. The resolution information may include the resolution information for each display module **100**, the position information of each display module **100**, and the pixel width of each supplementary display module **120**, etc. The pixel width is the pixel size of the supplementary display module **120** at the joint **130** in the width direction in order to facilitate determination of the pixel width that needs to be supplemented on the basis of the source image frame **800** and the image frame size allocated to each display module **100**, so that each target sub-image frame **910** finally corresponds to the resolution of the corresponding display module **100**. After obtaining the corresponding image and the related resolution information of the corresponding splicing screen display device, the pixel width to be supplemented on the image frame and the screen size allocated to each display module **100** can be determined according to the related resolution information. After each target sub-image frame **910** is obtained, each target sub-image frame **910** can be transmitted to each corresponding display module **100** for display.

(24) In the embodiment of the present disclosure, the way to make each target sub-image frame **910** finally formed correspond to the resolution of the corresponding display module **100** is to add the border display area **920** at the outer side of the source image frame **800**, and the border display area **920** is parallel to the joint **130**, the sum of pixel widths of the border display area **920** that are parallel to each other is equal to the sum of pixel widths of the supplementary display module **120** that are parallel to each other. That is, in this embodiment, according to the pixel width of each supplementary display module **120**, the border display area **920** parallel to the joint **130** is added at the outer side of the source image frame **800**, and finally each of the target sub-image frame **910** is formed.

(25) The above-mentioned border display area **920** can be configured as an area for displaying a



decorative border, such as an area displayed as a border of various colors such as black; or it can also be configured as an area for displaying a functional border, such as an area displaying time, temperature, progress bar, and so on.

(26) When the splicing screen display device is a display screen formed by a plurality of basic display modules **110** arranged in a straight line, the border display area **920** can be arranged at the outer side of the source image frame **800** parallel to the joint **130**, and can also be set at outer sides of opposite sides of the source image frame **800** parallel to the joint **130**. When the border display area **920** is disposed at the outer sides of the opposite sides of the source image frame **800** parallel to the joint **130**, the pixel widths of the border display area **920** on opposite sides may be the same or different. When the pixel widths of the border display area **920** on opposite sides are the same, the source image frame **800** is set in the center, and the visual impression is better. When the pixel widths of the border display area **920** on opposite sides are different, the pixel widths of the border display area **920** are wider, and content that can be displayed is also richer.

(27) When the splicing screen display device is a display screen constituted by a plurality of basic display modules **110** arranged in a rectangular array, the border display area **920** can be arranged at the adjacent two of the outer sides of the source image frame **800**, or can be arranged at three of the outer sides of the source image frame **800**, or can also be arranged at all the outer sides of the source image frame **800**. Meanwhile, when the border display area **920** is arranged at the outer sides of more than three sides of the source image frame **800**, the pixel widths of the border display area **920** on opposite sides may be the same or different. When the pixel widths of the border display area **920** on opposite sides are the same, the source image frame **800** is set in the center, and the visual impression is better. When the pixel widths of the border display area **920** on opposite sides are different, the pixel widths of the border display area **920** are wider, and the content that can be displayed is also richer. Meanwhile, the border display area **920** on the adjacent ones of the sides of the source image frame **800** may be respectively configured as an area for displaying a decorative frame and an area for displaying a functional frame.

(28) Meanwhile, there are many implementations for adding the border display area **920** at the outer side of the source image frame **800**. For example, the source image frame **800** is first divided into multiple sub-display image frames, and then the border display area **920** is added to the sub-display area located on the outermost side. It is also possible to add the border display area **920** to the source image frame **800** before dividing, which is not particularly limited in the present disclosure.

(29) Also referring to FIG. 4, the driving module **400** includes a port unit **410**, a driving unit **420**, a distribution unit **430**, and a substrate **440**. The port unit **410**, the driving unit **420**, and the distribution unit **430** are all integrated on the substrate **440**, and the port unit **410** is connected to the transmitting module **300** and the driving unit **420** with electrical signals, respectively. The distribution unit **430** is connected to the driving unit **420** and the supplementary display module **120** with electrical signals, respectively. The port unit **410** is configured to receive the target sub-supplementary image frame **912** transmitted by the transmitting module **300**. The driving unit **420** is configured to perform the third process on the target sub-supplemental image frame **912** received by the port unit **410**. The distribution unit **430** is configured to receive the target sub-supplemental image frame **912** processed by the driving unit **420**, and the target sub-supplemental image frame **912** is transmitted to the corresponding supplementary display module **120** to make the supplementary display module **120** display.

(30) That is, in this embodiment, the port unit **410** receives the target sub-supplemental image frame **912** transmitted by the transmitting module **300** and the target sub-supplemental image frame **912** is transmitted to the driving unit **420**. The driving unit **420** performs the third process on the target sub-supplemental image frame **912** from the port unit **410**, and then the distribution unit **430** controls the supplementary display module **120** to display the target sub-supplementary image frame **912**.

(31) Also referring to FIG. 7, the distribution unit **430** correspondingly includes a plurality of display interfaces **431**, and the supplementary display module **120** correspondingly includes a plurality of supplementary display units **1211**. The display interfaces **431** are provided on the same side, and are docked and fixed with the corresponding supplementary display unit **1211** and realizes electrical signal connection. The supplementary display units **1211** are arranged and spliced sequentially along a direction of the joint **130**. The distribution unit **430** transmits the corresponding display information to the corresponding supplementary display unit **1211** through each of the display interfaces **431**.

(32) In this embodiment, referring to FIG. 8, the above-mentioned supplementary display units **1211** are arranged in strips along the joint **130**, the frame width of each supplementary display unit **1211** is less than 5 mm, and the pixel width of each supplementary display unit **1211** is greater than a sum of widths of 8 pixels, and the distance between adjacent pixels of adjacent ones of the supplementary display units **1211** is less than 0.63 mm to ensure that the pixel density of the supplementary display module **120** is closer to that of the basic display module **110**, thereby giving users a better visual experience.

(33) In some embodiments of the present disclosure, also referring to FIG. 5, the above-mentioned driving module **400** includes two driving submodules, the main driving submodule **401** and the auxiliary driving submodule **402**. Each of the driving modules **400** includes a main driving submodule **401** and at least one auxiliary driving submodule **402**. The auxiliary driving submodule **402** is arranged at one side of the main driving submodule **401** along the joint **130**. The supplementary display module **120** includes a plurality of supplementary display submodules **121** corresponding to the main driving submodule **401** and the auxiliary driving submodule **402**, and each supplementary display submodule **121** correspondingly includes a plurality of supplementary display units **1211**. Each of the main driving submodule **401** and the auxiliary driving submodule **402** is respectively connected to the supplementary display submodule **121** with electrical signals.

(34) Each of the main driving submodule **401** and the auxiliary driving submodule **402** is provided with the port unit **410**, the driving unit **420**, and the distribution unit **430** thereon. The port unit **410** of the main driving submodule **401** includes a receiving port and a transmitting port, which are the main receiving port **411** and the main transmitting port **412**, respectively. The port unit **410** of the auxiliary driving module **400** includes a receiving port, which is the auxiliary receiving port **413**.

(35) In this embodiment, the main receiving port **411** is connected to the transmitting module **300** with electrical signals, and the main transmitting port **412** is connected to the main receiving port **411** and the auxiliary receiving port **413** with electrical signals. The transmitting module **300** transmits the target sub-supplemental image frame **912** to the main receiving port **411**. After the main transmitting port **412** receives the target sub-supplemental image frame **912**, the target sub-supplemental image frame **912** is transmitted to the auxiliary receiving port **413** through the main transmitting port **412**. Meanwhile, the main receiving port **411** also transmits the target sub-supplemental image frame **912** to the driving unit **420** on the main driving submodule **401** to control the supplementary display submodule **121** corresponding to the main driving submodule **401** to display. Similarly, after the auxiliary receiving port **413** receives the target sub-supplemental image frame **912**, it transmits the target sub-supplemental image frame **912** to the driving unit **420** on the auxiliary driving submodule **402** to control the supplementary display submodule **121** corresponding to the auxiliary driving submodule **402** to display.

(36) When there are multiple auxiliary driving submodules **402**, the main transmitting port **412** can be connected to the auxiliary receiving port **413** of each auxiliary driving module **400** with electrical signals, and distribute the target sub-supplemental image frame **912** to each of the auxiliary driving submodules **402**.

(37) In the embodiment of the present disclosure, each of the auxiliary driving submodules **402** is also provided with a transmitting port, which is the auxiliary transmitting port **414**. The main driving submodule **401** and each of the auxiliary driving submodules **402** are connected by cascade

connection. The main driving submodule **401** and each of the auxiliary driving submodules **402** are arranged in sequence along the joint **130**. The auxiliary transmitting ports of each of the auxiliary driving submodules **402** are all connected to the receiving port of an adjacent driving submodule with electrical signals. The auxiliary receiving port **413** of each of the auxiliary driving submodules **402** is connected to the transmitting port of another adjacent driving submodule with electrical signals. The main driving submodule **401** transmits the sub-supplemental display image frame to the auxiliary driving submodule **402** adjacent to the main driving submodule **401**, and the auxiliary driving submodules **402** transmits the sub-supplemental display image frame to another auxiliary driving submodules **402** adjacent to the auxiliary driving submodule **402**.

(38) In some embodiments of the present disclosure, referring to FIG. 6 and FIG. 7, the above-mentioned driving submodule includes at least one driving board, and the at least one driving board includes a substrate **440** and a port unit **410**, a driving unit **420**, and a distribution unit **430** disposed on the substrate **440**.

(39) When the above-mentioned driving submodule includes multiple driving boards, it includes a main driving board **403** and an auxiliary driving board **404** connected to the main driving board **403**. Generally, a number of the auxiliary driving board **404** is one, but in other embodiments, the number of the auxiliary driving board **404** may also be two or more. The auxiliary driving board **404** is arranged at one side of the main driving board **403** along the joint **130**, and realizes electrical connection and structural connection through an interface.

(40) The main driving board **403** includes a substrate **440** and a port unit **410**, a driving unit **420**, a distribution unit **430**, and an expansion interface **450** provided on the substrate **440**. The driving unit **420** is arranged in the middle of the substrate **440**, the port unit **410** and the distribution unit **430** are respectively arranged on opposite sides of the driving unit **420**, and the expansion interface **450** is arranged at the end of the substrate **440**. That is, the display interface **431** of the distribution unit **430** is arranged on a longer side of the substrate **440** along the joint **130**, and the expansion interface **450** is arranged on a shorter side of the substrate **440** adjacent to the display interface **431**.

(41) The auxiliary driving board **404** includes the substrate **440**, and the distribution unit **430** and an expansion interface **450** provided on the substrate **440**. Consistent with the main driving board **403**, the display interface **431** of the distribution unit **430** is arranged on the longer side of the substrate **440** along the joint **130**, and the expansion interface **450** is arranged on the shorter side of the substrate **440** adjacent to the display interface **431**.

(42) The main driving board **403** and the auxiliary driving board **404** are docked and fixed to each other through the expansion interface **450** to realize electrical signal connection. The main driving board **403** transmits the corresponding target sub-supplemental image frame **912** to the auxiliary driving board **404** through the expansion interface **450**.

(43) That is, in this embodiment, after the processing module **200** receives the source image frame **800**, the first process is performed on the source image frame **800** to obtain the target sub-basic image **911** corresponding to the basic display module **110** and the target sub-supplemental image frame **912** corresponding to the supplementary display module **120**. Then, the processing module **200** transmits the target sub-basic image frame **911** to the corresponding driver module to drive the basic display module **110** for display, and transmits the target sub-supplemental image frame **912** to the transmitting module **300**. The transmitting module **300** performs the second process on the target sub-supplemental image frame **912**, and then transmits the target sub-supplemental image frame **912** to the driving module **400** corresponding to the supplementary display module **120**.

(44) The main driving board **403** of the main driving submodule **401** of the driving module **400** receives the above-mentioned target sub-supplemental image frame **912**, and transmits the target sub-supplemental image frame **912** to the auxiliary driving submodule **402** through the main transmitting port **412**, which is connected to the auxiliary driving submodule **402** with electrical signals. Meanwhile, the main driving board **403** of the main driving submodule **401** performs the third process through the driving unit **420** disposed on the main driving board **403**, and converts the

target sub-supplemental image frame **912** into an image signal that can be displayed by each of the supplementary display unit **1211**, distributes the image signal to the display interface **431** disposed thereon, and enables the supplementary display unit **1211** to perform display. Meanwhile, the main driver board **403** also transmits the processed image signal to the auxiliary driving board **404** through the expansion interface **450**, and distributes the processed image signal to the display interfaces **431** on the auxiliary driving board **404**, so that the supplementary display unit **1211** docked on the auxiliary driving board **404** can also perform display. The auxiliary driving submodule **402** also includes the main driving board **403** and the auxiliary driving board **404**, and its processing process is the same as that of the main driving module **400**.

(45) In other embodiments, a number of the driving board may also be only one. In this case, the driving board is the main driving board **403**. The auxiliary driving board **404** is an extension accessory of the main driving board **403**, which enables the driving unit **420** on the main driving board **403** to control as many supplementary display units **1211** as possible, so as to save production costs and speed up transmission efficiency.

(46) The display device and the splicing screen display device provided in the embodiments of the present application have been described in detail above. Specific examples are used in this document to explain the principles and implementation of the present invention. The descriptions of the above embodiments are only for understanding the method of the present invention and its core ideas, to help understand the technical solution of the present application and its core ideas, and a person of ordinary skill in the art should understand that it can still modify the technical solution described in the foregoing embodiments, or equivalently replace some of the technical features. Such modifications or replacements do not depart the spirit of the corresponding technical solutions beyond the scope of the technical solutions of the embodiments of the present application.

## Claims

1. A splicing screen display device, wherein the splicing screen display device comprises: display modules comprising a plurality of basic display modules and at least one supplementary display module, wherein the supplementary display module is disposed at a joint of two of the basic display modules; a processing module connected to the display modules with electrical signals and configured to perform a first process on a received source image frame to obtain a target sub-image frame corresponding to each of the display modules; a transmitting module connected to the processing module with electrical signals and configured to receive and perform a second process on a target sub-supplemental image frame transmitted by the processing module, wherein the target sub-supplemental image frame is the target sub-image frame corresponding to the supplementary display module, wherein the second process is to further optimize the image quality of the target sub-supplemental image; and a driving module disposed corresponding to the supplementary display module, and connected to the transmitting module and the supplementary display module with electrical signals, wherein the driving module comprises a substrate, and a driving unit and a distribution unit integrated on the substrate, the driving unit is connected to the distribution unit with electrical signals, the driving unit is configured to perform a third process on the received target sub-supplemental image frame and transmit the received target sub-supplemental image frame to the distribution unit; and wherein the distribution unit is connected to the supplementary display module with electrical signals, and the distribution unit is configured to receive the target sub-supplemental image frame processed by the driving unit and distributes the target sub-supplemental image frame to a corresponding one of the supplementary display modules for the supplementary display module to display, wherein the driving module comprises a driving board, and the driving board comprises the substrate, and a port unit, the driving unit, and the distribution unit disposed on the substrate, wherein the driving board comprises: a main driving board comprising the substrate, the port unit, the driving unit, the distribution unit, and an expansion

connector; an auxiliary driving board disposed at one side of the main driving board along the joint, and comprising the substrate, the distribution unit, and the expansion connector, wherein the main driving board is docked and fixed to the auxiliary driving board through the expansion connector to realize electrical signal connection, wherein only the main driving board comprises the driving unit, and the driving unit is electrically connected to a plurality of display interfaces on both the main driving board and the auxiliary driving board to enable both the main driving board and the auxiliary driving board to emit light.

2. The splicing screen display device according to claim 1, wherein after receiving the target sub-supplemental image, and after the third process is performed through the driving unit on the main driving board, the target sub-supplemental image is converted into an image signal that can be displayed by each of the supplementary display units, the image signal is correspondingly distributed to a display interface on the supplementary display unit, and the supplementary display unit is made to display through a display interface.

3. The splicing screen display device according to claim 1, wherein the main driving board transmits a processed image signal to the auxiliary driving board through an expansion interface, the processed image signal is distributed to each of the plurality of display interfaces on the auxiliary driving board, so that the supplementary display unit docked on the auxiliary driving board also displays.

4. The splicing screen display device according to claim 1, wherein the display connectors are disposed at one side of the substrate along the joint, and the expansion connector is disposed on the substrate at another side of the substrate adjacent to the side where a plurality of display connectors are disposed.

5. The splicing screen display device according to claim 1, wherein the driving module further comprises: the port unit connected to the driving unit and the transmitting module with electrical signals and configured to receive the target sub-supplemental image frame transmitted by the transmitting module, and transmit the target sub-supplemental image frame to the driving unit.

6. The splicing screen display device according to claim 5, wherein the supplementary display module comprises a plurality of supplementary display units, and the distribution unit correspondingly comprises a plurality of display connectors, the display connectors are disposed on a same side, and the display connectors are docked and fixed to a corresponding one of the supplementary display units to realize electrical signal connection.

7. The splicing screen display device according to claim 6, wherein the supplementary display units are disposed in strips along the joint, a border width of each of the supplementary display units is less than 5 mm, and a pixel width of each of the display units is greater than a sum of widths of 8 pixels.

8. The splicing screen display device according to claim 6, wherein a distance between adjacent ones of pixels of adjacent ones of the supplementary display units is less than 0.63 mm.

9. The splicing screen display device according to claim 5, wherein the driving module comprises a plurality of driving submodules, each of the driving submodules comprises a main driving submodule and an auxiliary driving submodule disposed at one side of the main driving submodule along the joint, and the main driving submodule transmits the target sub-supplemental image to the auxiliary driving sub-module.

10. The splicing screen display device according to claim 9, wherein the port unit is disposed on each of the main driving submodule and the auxiliary driving submodule, and the port unit comprises a receiving port and a transmitting port; wherein the receiving port of the main driving submodule is a main receiving port, the receiving port of the auxiliary driving submodule is an auxiliary receiving port, and the transmitting port of the main driving submodule is a main transmitting port; and wherein the main receiving port is connected to the transmitting module with electrical signals and configured to receive the target sub-supplemental image frame transmitted by the transmitting module, the main transmitting port is connected to the main receiving port and the

- auxiliary receiving port with electrical signals and configured to transmit the target sub-supplemental image frame received by the main receiving port to the auxiliary receiving port.
11. The splicing screen display device according to claim 9, wherein a number of auxiliary driving submodules is multiple, and the main driving submodule and each of the auxiliary driving submodules are connected by cascade connection.
12. The splicing screen display device according to claim 11, wherein the main driving submodule and each of the auxiliary driving submodules are arranged in sequence along the joint.
13. The splicing screen display device according to claim 9, wherein the driving submodule comprises at least one driving board, and the at least one driving board comprises: a main driving board comprising the substrate, the port unit, the driving unit, the distribution unit, and an expansion connector; an auxiliary driving board disposed at one side of the main driving board along the joint, and comprising the substrate, the distribution unit, and the expansion connector, wherein the main driving board is docked and fixed to the auxiliary driving board through the expansion connector to realize electrical signal connection.
14. The splicing screen display device according to claim 9, wherein the supplementary display module comprises a plurality of supplementary display submodules corresponding to the main driving submodule and the auxiliary driving submodules, and each of the main driving submodule and the auxiliary driving submodules is respectively correspondingly connected to the supplementary display submodules with electrical signals.
15. The splicing screen display device according to claim 14, wherein each of the supplementary display submodules correspondingly comprises a plurality of supplementary display units.
16. The splicing screen display device according to claim 1, wherein the processing module comprises: a receiving submodule configured to obtain the source image frame and a resolution information of the splicing screen display device, wherein the resolution information comprises a pixel width of the supplementary display module, and the pixel width is a pixel size of the supplementary display module at the joint in a width direction; a processing submodule configured to add a border display area at an outer side of the source image frame and split the source image frame to form the target sub-image frame corresponding to each of the display modules, wherein the border display area is parallel to the joint, and a sum of pixel widths of the border display area that are parallel to each other is equal to a sum of pixel widths of the supplementary display module that are parallel to each other; and a transmitting submodule configured to transmit each of the target sub-image frame to a corresponding one of the display modules for display.
17. The splicing screen display device according to claim 16, wherein the splicing screen display device is a display screen formed by a plurality of basic display modules arranged in a straight line, and the border display area is arranged near at least one outer side of the source image frame parallel to the joint.
18. The splicing screen display device according to claim 16, wherein the splicing screen display device is a display screen constituted by a plurality of basic display modules arranged in a rectangular array, and the border display area is arranged at adjacent two of the outer sides of the source image frame.
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