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Hwang

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(54) **OLED DISPLAY DEVICE COMPENSATING IMAGE DECAY**

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G09G 3/32	(2016.01)
G09G 3/20	(2006.01)

(52) **U.S. Cl.**

CPC ***G09G 3/3208*** (2013.01); ***G09G 3/20*** (2013.01); *G09G 2320/043* (2013.01); *G09G 2320/0693* (2013.01); *G09G 2360/145* (2013.01); *G09G 2360/16* (2013.01)

(58) **Field of Classification Search**

CPC G09G 3/30; G09G 3/36; G09G 5/00; G09G 5/10; G06F 3/038; G06F 3/048; G11C 19/00

USPC 345/76, 77, 78

See application file for complete search history.

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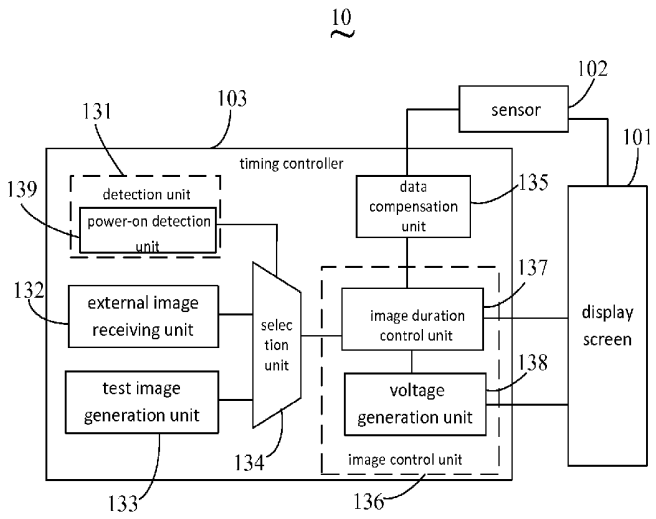
(57) **ABSTRACT**

An OLED display device includes a display screen, a sensor, and a timing controller. The timing controller includes a detection unit, a test image generation unit, a data compensation unit, and image control unit. The detection unit provides a command for generating a test image. The test image generation unit generates a test image according to the command. The data compensation unit receives a decayed signal that corresponds to the test image and is detected by the sensor in order to generate a compensation signal according to the decayed signal. In response to the compensation signal, the image control unit compensates an external image to achieve normal displaying of the external image on the display screen.

7 Claims, 7 Drawing Sheets



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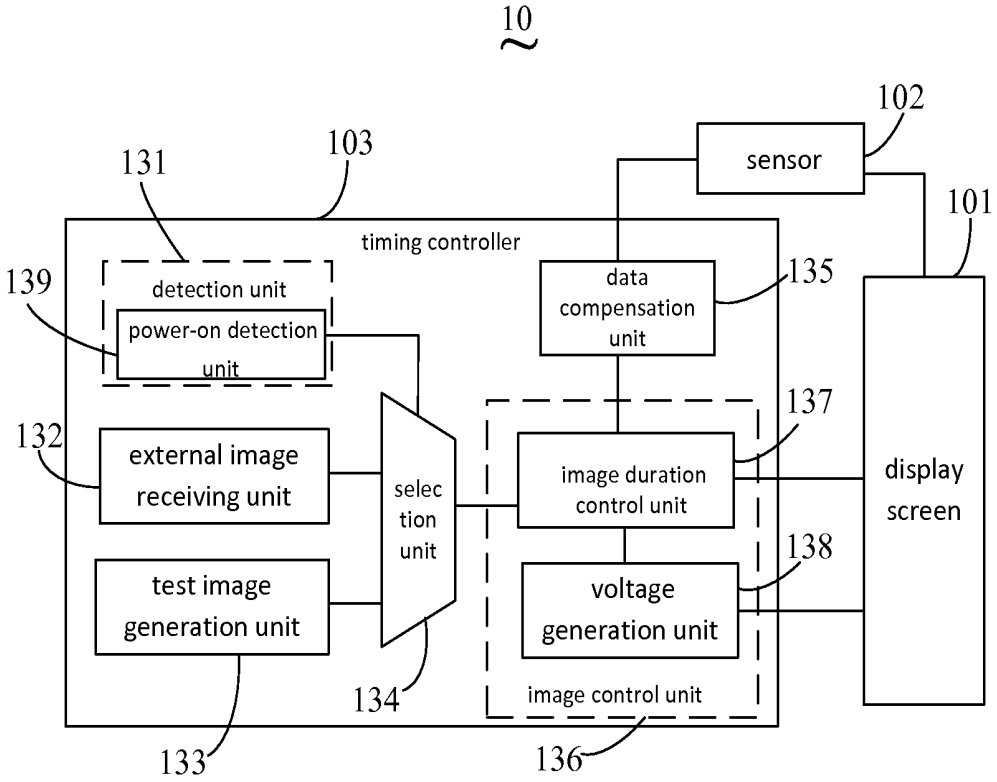
10
102
sensor
101
103
131
timing controller
139
detection unit
power-on detection unit
data compensation unit
135
137
132
external image receiving unit
selec tion unit
image duration control unit
display screen
138
test image generation unit
voltage generation unit
134
image control unit
133
136

Figure 1

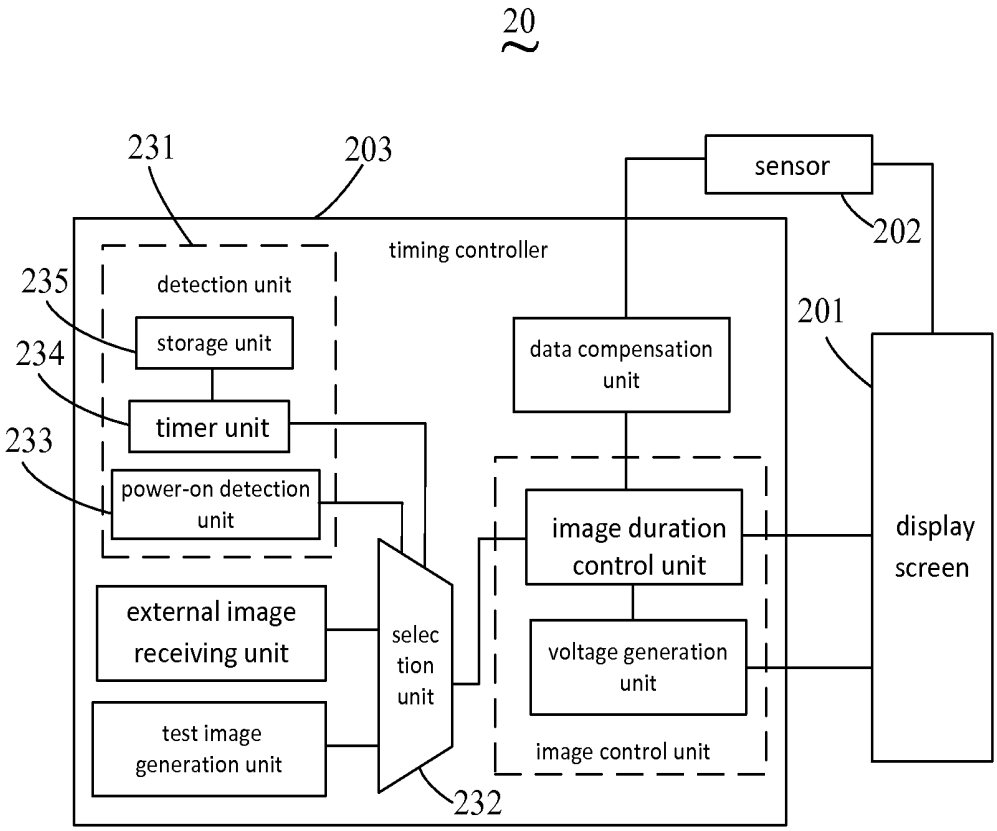
20
231
203
sensor
202
timing controller
235
detection unit
201
storage unit
234
data compensation unit
timer unit
233
power-on detection unit
image duration control unit
display screen
external image receiving unit
selec tion unit
voltage generation unit
test image generation unit
image control unit
232

Figure 2

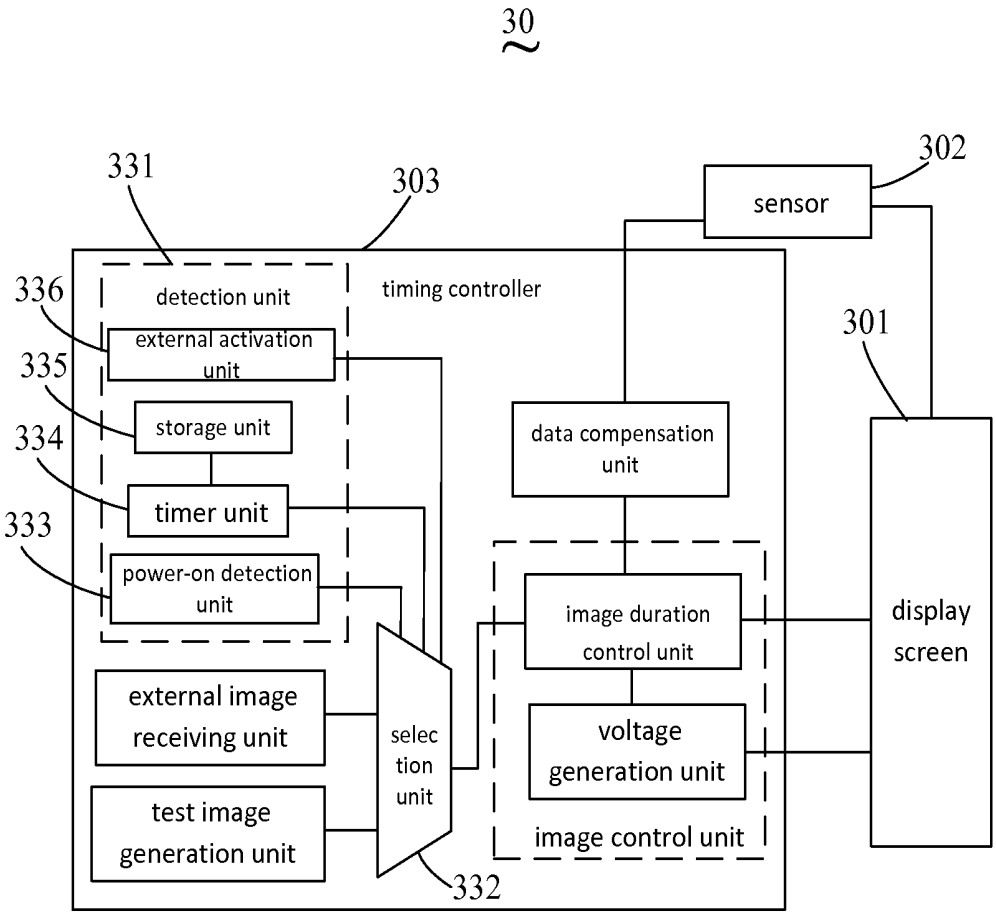
30
331
303
302
sensor
336
detection unit
timing controller
external activation unit
335
storage unit
301
334
data compensation unit
timer unit
333
power-on detection unit
image duration control unit
display screen
external image receiving unit
selec tion unit
voltage generation unit
test image generation unit
image control unit
332

Figure 3

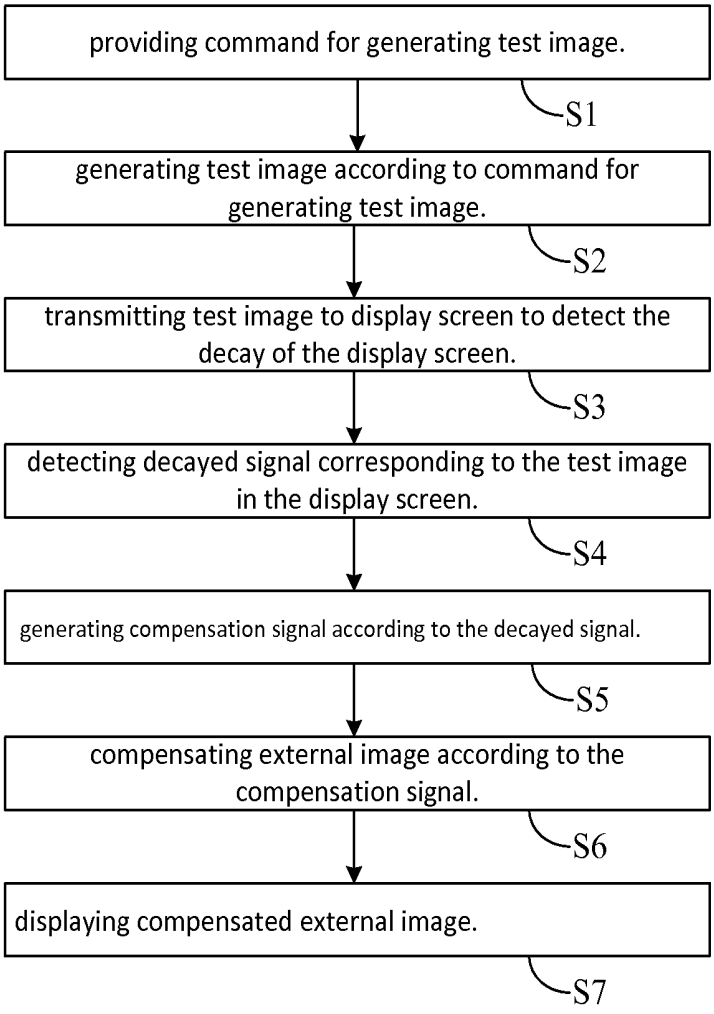
providing command for generating test image.
S1
generating test image according to command for generating test image.
S2
transmitting test image to display screen to detect the decay of the display screen.
S3
detecting decayed signal corresponding to the test image in the display screen.
S4
generating compensation signal according to the decayed signal.
S5
compensating external image according to the compensation signal.
S6
displaying compensated external image.
S7

Figure 4

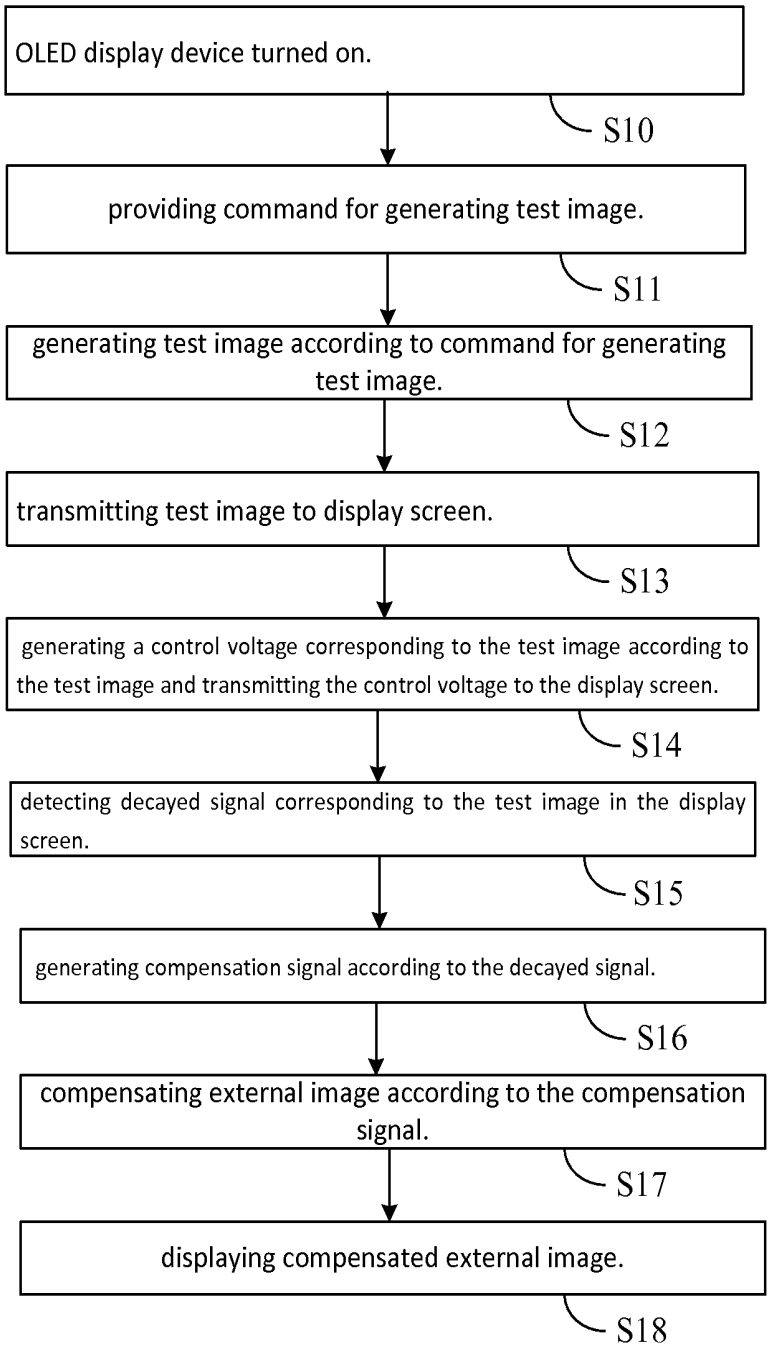
OLED display device turned on.
S10
providing command for generating test image.
S11
generating test image according to command for generating test image.
S12
transmitting test image to display screen.
S13
generating a control voltage corresponding to the test image according to the test image and transmitting the control voltage to the display screen.
S14
detecting decayed signal corresponding to the test image in the display screen.
S15
generating compensation signal according to the decayed signal.
S16
compensating external image according to the compensation signal.
S17
displaying compensated external image.
S18

Figure 5

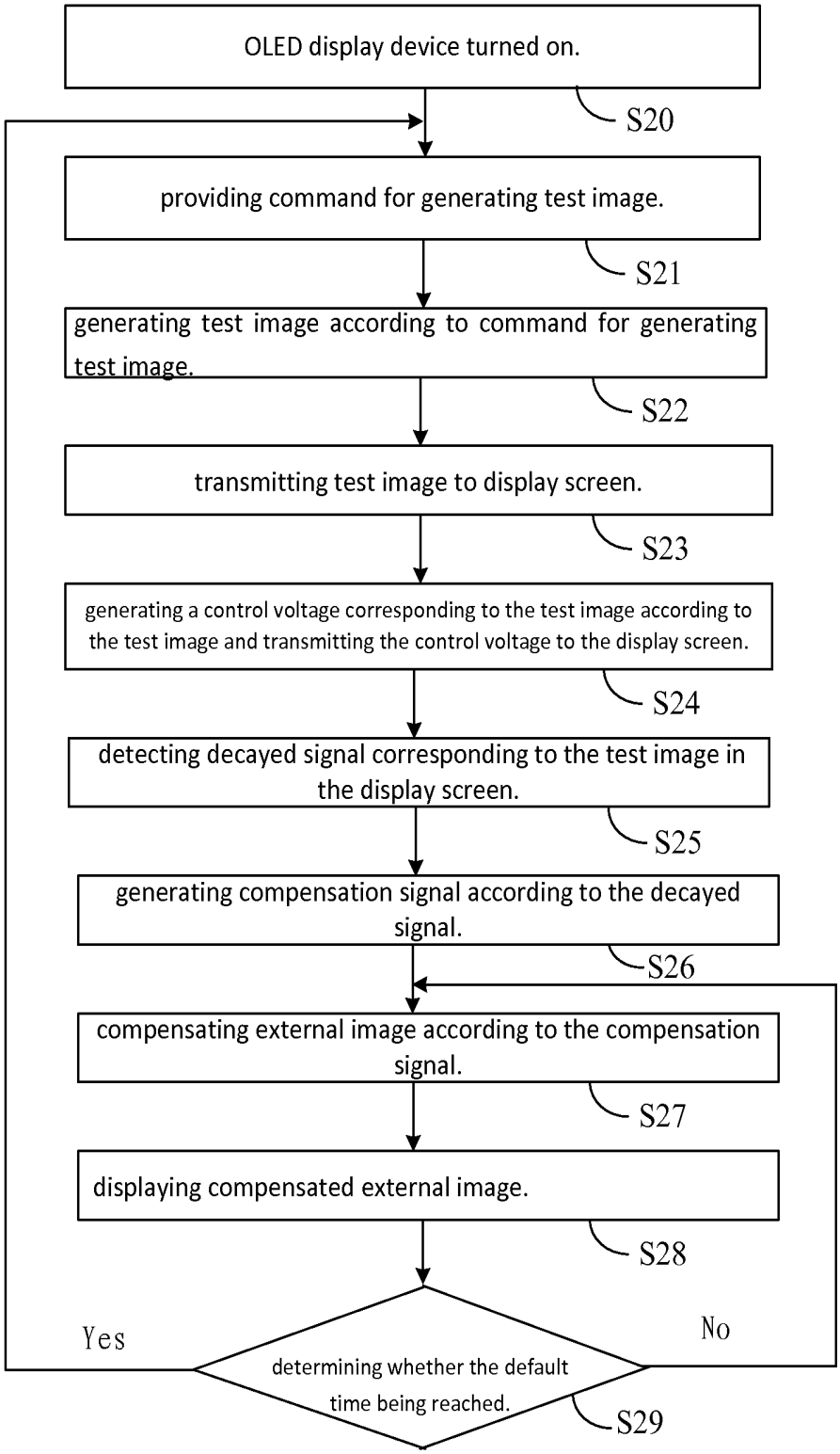
OLED display device turned on.
S20
providing command for generating test image.
S21
generating test image according to command for generating test image.
S22
transmitting test image to display screen.
S23
generating a control voltage corresponding to the test image according to the test image and transmitting the control voltage to the display screen.
S24
detecting decayed signal corresponding to the test image in the display screen.
S25
generating compensation signal according to the decayed signal.
S26
compensating external image according to the compensation signal.
S27
displaying compensated external image.
S28
Yes
No
determining whether the default time being reached.
S29

Figure 6

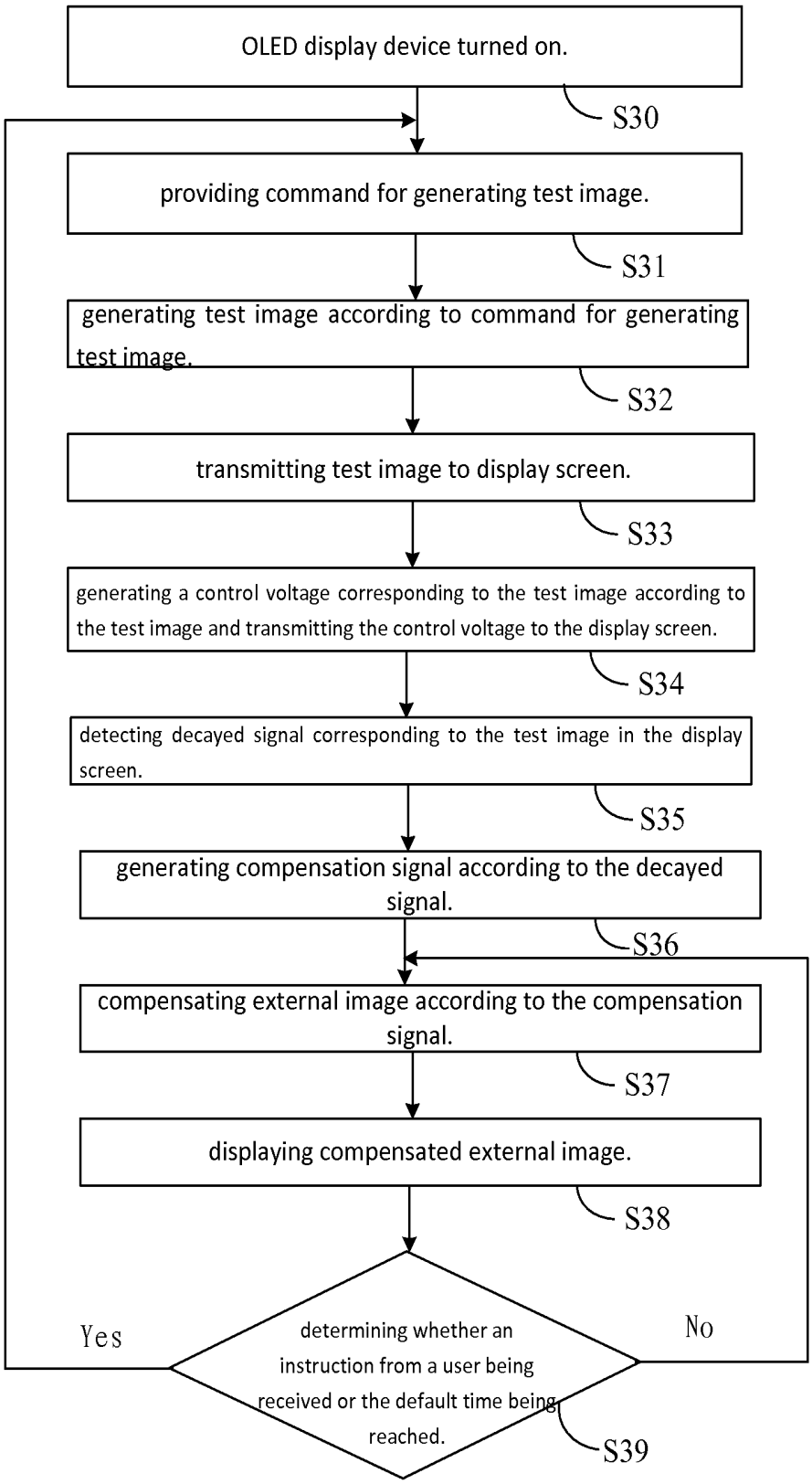
OLED display device turned on.
S30
providing command for generating test image.
S31
generating test image according to command for generating test image.
S32
transmitting test image to display screen.
S33
generating a control voltage corresponding to the test image according to the test image and transmitting the control voltage to the display screen.
S34
detecting decayed signal corresponding to the test image in the display screen.
S35
generating compensation signal according to the decayed signal.
S36
compensating external image according to the compensation signal.
S37
displaying compensated external image.
S38
determining whether an instruction from a user being received or the default time being reached.
S39
Yes
No

Figure 7

OLED DISPLAY DEVICE COMPENSATING IMAGE DECAY

CROSS REFERENCE TO RELATED APPLICATIONS

This is a divisional application of co-pending patent application Ser. No. 13/697,955, "OLED Display Device Compensating Image Decay", filed on Nov. 14, 2012.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to the field of displaying techniques, and in particular to an OLED display device and control method thereof.

2. The Related Arts

Currently, organic light-emitting diode (OLED) is widely applied to various display device because of the advantages of fast response, light weight, thin, simple structure and low cost. However, OLED display device often shows uneven situation because of the variable factor of the light-emitting material. In addition, the uneven display situation will decay as the drive time and greatly affect the display quality.

SUMMARY OF THE INVENTION

The technical issue to be addressed by the present invention is to provide an OLED display device and control method thereof, able to improve the deteriorated uneven display as the time passes.

The present invention provides an OLED display device, which comprises: a display screen, a sensor and a timing controller, wherein the display screen being configured to display image, the sensor being configured to inspect decayed signal of the display screen when displaying, and the timing controller comprising a detection unit, an external image receiving unit, a test image generation unit, a selection unit, a data compensation unit and image control unit; wherein the detection unit being configured to provide command for generating test image; the external image receiving unit being configured to receive external image; the test image generation unit being configured to generate test image according to the command for generating test image, the selection unit being configured to select test image input when receiving command for generating test image, or to select external image input when not receiving command for generating test image, and then to transmit the input test image or external image to the image control unit, the image control unit being configured to transmit test image to the display screen for detecting decay of display screen when inputting test image; and the data compensation unit being configured to obtain decayed signal corresponding to test image detected by the sensor and to generate compensation signal to transmit to the image control unit according to the decayed signal; when the image control unit inputting external image, the external image being compensated according to the compensation signal so that the external image able to display normally in the display screen; wherein the detection unit comprising a power-on detection unit, the power-on detection unit being configured to provide command for generating test image when the OLED display device turned on; the decayed signal being a voltage signal or a current signal, the data compensation unit storing in advance standard voltage signal or standard current signal corresponding to the test image before inputting to display screen, then after the test image inputted to display screen, using the sensor to detect the decayed voltage signal or decayed current signal corresponding to the test image, and determining the value of compensation signal according to the difference between the standard voltage signal and decayed voltage signal or the difference between the standard current signal and decayed current signal.

According to a preferred embodiment of the present invention, the detection unit further comprises a timer unit and a storage unit, wherein the storage unit stores default time and the timer unit obtains the default time and provides command for generating test image based on the default time.

According to a preferred embodiment of the present invention, the detection unit further comprises an external activation unit, and the external activation unit provides command for generating test image after receiving instructions inputted by a user.

According to a preferred embodiment of the present invention, the image control unit further comprises an image duration control unit, and when inputting external image, the image duration control unit controls duration of each frame of the external image when entering display screen based on the compensation signal.

According to a preferred embodiment of the present invention, the image control unit further comprises a voltage generation unit, and when inputting external image, the voltage generation unit generates control voltage of external image based on compensation signal and transmits the control signal to display screen.

The present invention provides an OLED display device, which comprises: a display screen, a sensor and a timing controller, wherein the display screen being configured to display image, the sensor being configured to inspect decayed signal of the display screen when displaying, and the timing controller comprising a detection unit, an external image receiving unit, a test image generation unit, a selection unit, a data compensation unit and image control unit; wherein the detection unit being configured to provide command for generating test image; the external image receiving unit being configured to receive external image; the test image generation unit being configured to generate test image according to the command for generating test image, the selection unit being configured to select test image input when receiving command for generating test image, or to select external image input when not receiving command for generating test image, and then to transmit the input test image or external image to the image control unit, the image control unit being configured to transmit test image to the display screen for detecting decay of display screen when inputting test image; and the data compensation unit being configured to obtain decayed signal corresponding to test image detected by the sensor and to generate compensation signal to transmit to the image control unit according to the decayed signal; when the image control unit inputting external image, the external image being compensated according to the compensation signal so that the external image able to display normally in the display screen.

According to a preferred embodiment of the present invention, the detection unit further comprises a power-on detection unit, and the power-on detection unit is configured to provide command for generating test image when the OLED display device is turned on.

According to a preferred embodiment of the present invention, the detection unit further comprises a timer unit and a storage unit, wherein the storage unit stores default

time and the timer unit obtains the default time and provides command for generating test image based on the default time.

According to a preferred embodiment of the present invention, the detection unit further comprises an external activation unit, and the external activation unit provides command for generating test image after receiving instructions inputted by a user.

According to a preferred embodiment of the present invention, the decayed signal is a voltage signal or a current signal, the data compensation unit stores in advance standard voltage signal or standard current signal corresponding to the test image before inputting to display screen, then after the test image inputted to display screen, uses the sensor to detect the decayed voltage signal or decayed current signal corresponding to the test image, and determines the value of compensation signal according to the difference between the standard voltage signal and decayed voltage signal or the difference between the standard current signal and decayed current signal.

According to a preferred embodiment of the present invention, the image control unit further comprises an image duration control unit, and when inputting external image, the image duration control unit controls duration of each frame of the external image when entering display screen based on the compensation signal.

According to a preferred embodiment of the present invention, the image control unit further comprises a voltage generation unit, and when inputting external image, the voltage generation unit generates control voltage of external image based on compensation signal and transmits the control signal to display screen.

The present invention provides a control method of OLED display device, the OLED comprising a display screen, the control method comprises the steps of: providing command for generating test image; generating test image according to command for generating test image; transmitting test image to display screen to detect the decay of the display screen; detecting decayed signal corresponding to the test image in the display screen; generating compensation signal according to the decayed signal; compensating external image according to the compensation signal; and displaying compensated external image.

According to a preferred embodiment of the present invention, the command for generating test image is provided when the OLED display device is turned on.

According to a preferred embodiment of the present invention, a default time is preset and stored, and the command for generating test image is provided according to the default time.

According to a preferred embodiment of the present invention, a test is performed to determine whether instruction inputted by a user, and if so, the command for generating test image is provided.

According to a preferred embodiment of the present invention, before the step of transmitting test image to display screen to detect the decay of the display screen, the method further comprises a step of storing in advance standard voltage signal or standard current signal corresponding to test image; the step of detecting decayed signal corresponding to the test image in the display screen further comprises: detecting decayed voltage signal or decayed current signal corresponding to test image in display screen; and the step of generating compensation signal according to the decayed signal further comprises: determining the value of compensation signal according to the difference between the standard voltage signal and the decayed voltage signal, or the difference between the standard current signal and the decayed current signal.

The efficacy of the present invention is that to be distinguished from the state of the art. The present invention disposes detection unit to provide command for generating test image, provides test image to detect the decay in displayed image in real time and generates corresponding compensation signal to compensate external image to remove the impact of decay to improve display quality. The present invention also provides a control method of OLED display device so that the present invention can compensate external image in real time according to command for generating test image and to improve the uneven display situation caused by decay of OLED display device as time passes.

BRIEF DESCRIPTION OF THE DRAWINGS

To make the technical solution of the embodiments according to the present invention, a brief description of the drawings that are necessary for the illustration of the embodiments will be given as follows. Apparently, the drawings described below show only example embodiments of the present invention and for those having ordinary skills in the art, other drawings may be easily obtained from these drawings without paying any creative effort. In the drawings:

FIG. **1** is a schematic view showing the structure of the first embodiment of an OLED display device according to the present invention;

FIG. **2** is a schematic view showing the structure of the second embodiment of an OLED display device according to the present invention;

FIG. **3** is a schematic view showing the structure of the third embodiment of an OLED display device according to the present invention;

FIG. **4** is a flowchart of an embodiment of a control method of OLED display device according to the present invention;

FIG. **5** is a flowchart of a specific control method of OLED display device according to the present invention;

FIG. **6** is a flowchart of another specific control method of OLED display device according to the present invention; and

FIG. **7** is a flowchart of yet another specific control method of OLED display device according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. **1**, FIG. **1** is a schematic view showing the structure of the first embodiment of an OLED display device according to the present invention. As shown in FIG. **1**, an OLED display device **10** of the present invention comprises a display screen **101**, a sensor **102** and a timing controller **103**.

In the instant embodiment, the sensor **102** is connected respectively to the display screen **101** and the timing controller **103**, and the timing controller **103** is further connected to the display screen **101**, wherein the display screen **101** is configured to display image, the sensor **102** is configured to inspect decayed signal of the display screen **101** when displaying, and the timing controller **103** is configured to control normal display of the display screen **103** and comprises a detection unit **131**, an external image

receiving unit **132**, a test image generation unit **133**, a selection unit **134**, a data compensation unit **135** and image control unit **136**.

In the instant embodiment, the detection unit **131**, the external image receiving unit **132** and the test image generation unit **133** are connected respectively to the selection unit **134**. The selection unit **134** is further connected to image control unit **136**. The image control unit **136** is further connected to display screen **101** and data compensation unit **135**. The data compensation unit **135** is further connected to the sensor **102**.

In the instant embodiment, the detection unit **131** is configured to provide command for generating test image; the external image receiving unit **132** is configured to receive external image; the test image generation unit **133** is configured to generate test image according to the command for generating test image, the selection unit **134** is configured to select test image input when receiving command for generating test image, or to select external image input when not receiving command for generating test image, and then to transmit the input test image or external image to the image control unit **136**; and the image control unit **136** is configured to transmit test image to the display screen **101** for detecting decay of display screen **101** when inputting test image. The data compensation unit **135** is configured to obtain decayed signal corresponding to test image detected by the sensor **102** and to generate compensation signal to transmit to the image control unit **136** according to the decayed signal, wherein the decayed signal is a voltage signal or current signal.

Specifically, the data compensation unit **135** stores in advance standard voltage signal or standard current signal corresponding to the test image before inputting to display screen **101**. Then, after the test image inputted to display screen **101**, the sensor **102** is used to detect the decayed voltage signal or decayed current signal corresponding to the test image. Finally, the data compensation unit **135** determines the value of compensation signal according to the difference between the standard voltage signal and decayed voltage signal or the difference between the standard current signal and decayed current signal.

When the image control unit **136** inputs external image, the external image is compensated according to the compensation signal so that the external image is able to display normally in the display screen **101**.

Specifically, the image control unit **136** further comprises an image duration control unit **137** and a voltage generation unit **138**, wherein image duration control unit **137** is connected respectively to selection unit **134**, compensation unit **135**, display screen **101** and voltage generation unit **138**. The voltage generation unit **138** is further connected to display screen **101**.

In the instant embodiment, when inputting external image, based on the size of compensation signal provided by compensation unit **135**, the image duration control unit **137** controls duration (that is, frequency) of each frame of the external image when entering display screen **101**. The image duration control unit **137** further transmits the external image signal and the compensation signal to voltage generation unit **138**. The voltage generation unit **138**, based on the external image signal and the compensation signal, generates a control voltage of external image and transmits the control voltage to display screen **101**. Therefore, the image duration control unit **137** and the voltage generation unit **138** commonly control the external image according to the compensation signal so that the external image is displayed normally in display screen **101**.

It should be noted that when the image duration control unit **137** inputs test image, the image duration control unit **137** transmits the test image directly to display screen **101** and also transmits the signal of test image to the voltage generation unit **138**. The voltage generation unit **138**, based on the test image signal, generates a corresponding control voltage and transmits the control voltage to display screen **101**. It should be noted that the control voltage generated by the voltage generation unit **138** is not a voltage to compensate the test image, but a voltage to control whether the display screen **101** to display the test image.

In the instant embodiment, the detection unit **131** further comprises a power-on detection unit **139**. The power-on unit **139** is connected to selection unit **134**. The power-on detection unit **139** is configured to provide command for generating test image when the OLED display device **10** is turned on so that the OLED display device **10** can generate a test image whenever the OLED display device **10** is turned on to detect the decay of the OLED display device **10**. Therefore, the external image can be compensated in real time and the uneven display situation caused by decay of the OLED display device **10** as time passes can be improved.

Referring to FIG. **2**, FIG. **2** is a schematic view showing the structure of the second embodiment of an OLED display device according to the present invention. The difference between the OLED display device **20** and the OLED display device **10** of FIG. **1** is that the OLED display device **20** of FIG. **2** further comprises a timer unit and a storage unit.

As shown in FIG. **2**, the OLED display device **20** still comprises a display screen **201**, a sensor **202** and a timing controller **203**. The timing controller **203** comprises a detection unit **231** and selection unit **232**, wherein the detection unit **231**, in addition to power-on detection unit **233**, also comprises a timer unit **234** and a storage unit **235**, wherein the timer unit **234** is connected respectively to the storage unit **235** and selection unit **232**.

In the instant embodiment, the storage unit **235** stores a default time and the timer unit **234** obtains the default time from the storage unit **235** and provides command for generating test image based on the default time, wherein the default time is set during design or manufacturing the OLED display device **20** according to the requirement.

Therefore, the OLED display device **20** of the present embodiment not only provides test image when turned on, but also can provide test image according to the default time after turned on to re-detect the decay of OLED display device **20**. Therefore, the external image can be compensated in real time and the uneven display situation caused by decay of the OLED display device **20** as time passes can be improved.

Referring to FIG. **3**, FIG. **3** is a schematic view showing the structure of the third embodiment of an OLED display device according to the present invention. The difference between the OLED display device **30** and the OLED display device **20** of FIG. **2** is that the OLED display device **30** of FIG. **3** further comprises an external activation unit.

As shown in FIG. **3**, the OLED display device **30** still comprises a display screen **301**, a sensor **302** and a timing controller **303**. The timing controller **303** comprises a detection unit **331** and selection unit **332**, wherein the detection unit **331**, in addition to power-on detection unit **333**, timer unit **334** and storage unit **335**, also comprises an external activation unit **336**, wherein the external activation unit **336** is connected to the selection unit **232**.

In the instant embodiment, the external activation unit **336** provides command for generating test image after receiving instructions inputted by a user.

It should be noted that the priority of the command for generating test image provided by external activation unit **336** is higher than the command for generating test image provided by the timer unit **334**. During the interval of two adjacent preset default times stored in the storage unit **335**, when the external activation unit **336** receives instruction from a user, the external activation unit **336** provides command for generating test image; when the external activation unit **336** does not receive instruction from a user, the command for generating test image is provided by the timer unit **334** according to the default time.

Therefore, the OLED display device **30** of the present embodiment not only provides test image when turned on, but also can provide test image according to the default time after turned on as well as provide test image on user instruction to re-detect the decay of OLED display device **30** so that the OLED display device **30** can execute detection any time. Therefore, the external image can be compensated in real time and the uneven display situation caused by decay of the OLED display device **30** as time passes can be improved.

Referring to FIG. **4**, FIG. **4** is a flowchart of an embodiment of a control method of OLED display device according to the present invention, wherein the OLED display device comprises a display screen. As shown in FIG. **4**, the control method of OLED display device comprises the following steps.

Step S**1**: providing command for generating test image.

Step S**2**: generating test image according to command for generating test image.

Step S**3**: transmitting test image to display screen to detect the decay of the display screen.

In step S**3**, before transmitting test image to display screen to detect the decay of the display screen, the method further comprises a step of storing in advance standard voltage signal or standard current signal corresponding to test image.

At the time of transmitting test image to display screen, a control voltage corresponding to the test image is also generated and the control voltage corresponding to the test image is transmitted to the display screen to control whether the test image is displayed in the display screen.

Step S**4**: detecting decayed signal corresponding to the test image in the display screen.

In step S**4**, decayed signal comprises decayed voltage signal and decayed current signal, wherein detecting decayed signal corresponding to the test image in the display screen is specifically to detect decayed voltage signal or decayed current signal corresponding to test image in display screen.

Step S**5**: generating compensation signal according to the decayed signal.

In step S**5**, generating compensation signal according to the decayed signal is specifically to determine the value of compensation signal according to the difference between the standard voltage signal stored in step S**3** and the decayed voltage signal detected in step S**4**, or the difference between the standard current signal stored in step S**3** and the decayed current signal detected in step S**4**.

Step S**6**: compensating external image according to the compensation signal.

In step S**6**, compensating external image according to the compensation signal is specifically to control the duration (that is, frequency) of each frame of the external image when entering display screen according to the compensation signal. Furthermore, a control voltage is generated according to the external image signal and the compensation signal, and the control voltage is transmitted to the display screen. Therefore, the duration of each frame of the external image when entering display screen and the control voltage of the external image are both controlled so that the external image can display normally in the display screen.

Step S**7**: displaying compensated external image.

Referring to FIG. **5**, FIG. **5** is a flowchart of a specific control method of OLED display device according to the present invention. As shown in FIG. **5**, the control method of OLED display device according to the present invention comprises specifically the following steps.

Step S**10**: OLED display device turned on.

Step S**11**: providing command for generating test image.

Step S**12**: generating test image according to command for generating test image.

Step S**13**: transmitting test image to display screen.

Step S**14**: generating a control voltage corresponding to the test image according to the test image and transmitting the control voltage to the display screen.

Step S**15**: detecting decayed signal corresponding to the test image in the display screen.

Step S**16**: generating compensation signal according to the decayed signal.

Step S**17**: compensating external image according to the compensation signal.

Step S**18**: displaying compensated external image.

Therefore, the control method of OLED display device of the instant embodiment is specifically to provide test image to detect the decay of the OLED display device each time the OLED display device is turned on. As such, the external image can be compensated in real time and the uneven display situation caused by decay of the OLED display device as time passes can be improved.

Referring to FIG. **6**, FIG. **6** is a flowchart of another specific control method of OLED display device according to the present invention. As shown in FIG. **6**, the control method of OLED display device according to the present invention comprises specifically the following steps.

Step S**20**: OLED display device turned on.

Step S**21**: providing command for generating test image.

Step S**22**: generating test image according to command for generating test image.

Step S**23**: transmitting test image to display screen.

Step S**24**: generating a control voltage corresponding to the test image according to the test image and transmitting the control voltage to the display screen.

Step S**25**: detecting decayed signal corresponding to the test image in the display screen.

Step S**26**: generating compensation signal according to the decayed signal.

Step S**27**: compensating external image according to the compensation signal.

Step S**28**: displaying compensated external image.

Step S**29**: determining whether the default time being reached.

In step S**29**, if the default time is reached, the method returns to step **21**; otherwise, the method returns to step S**27**. Specifically, when the default time is reached, the method returns to step **21** to provide command for generating test image to re-detect the OLED display device; otherwise, the method returns to step S**27** to continue compensating the external image by using the previous compensation signal detected in OLED display device, wherein the default time is preset and stored.

As such, the control method of OLED display device in FIG. **6** is to perform re-detection of the OLED display device when the default time is reached after the control

method of FIG. **5**. In addition to providing test image to OLED display for detection when the OLED display device is turned on, the method can provide test image according to the default time to re-detect the decay of OLED display device. Therefore, the external image can be compensated in real time and the uneven display situation caused by decay of the OLED display device as time passes can be improved.

Referring to FIG. **7**, FIG. **7** is a flowchart of yet another specific control method of OLED display device according to the present invention. As shown in FIG. **7**, the control method of OLED display device according to the present invention comprises specifically the following steps.

Step S**30**: OLED display device turned on.

Step S**31**: providing command for generating test image.

Step S**32**: generating test image according to command for generating test image.

Step S**33**: transmitting test image to display screen.

Step S**34**: generating a control voltage corresponding to the test image according to the test image and transmitting the control voltage to the display screen.

Step S**35**: detecting decayed signal corresponding to the test image in the display screen.

Step S**36**: generating compensation signal according to the decayed signal.

Step S**37**: compensating external image according to the compensation signal.

Step S**38**: displaying compensated external image.

Step S**39**: determining whether an instruction from a user being received or the default time being reached.

In step S**39**, if an instruction from a user is received or the default time is reached, the method returns to step **31**; otherwise, the method returns to step S**37**. Specifically, when an instruction from a user is received or the default time is reached, the method returns to step **31** to provide command for generating test image to re-detect the OLED display device; otherwise, the method returns to step S**37** to continue compensating the external image by using the previous compensation signal detected in OLED display device.

It should be noted that during two adjacent default times, if an instruction from a user is received, the method returns to step S**31** to provide command for generating test image to re-detect the OLED display device; if no instruction from a user is received, the method returns to step S**31** according to default time to provide command for generating test image to re-detect the OLED display device.

In the instant embodiment, the default time is preset and stored.

As such, the control method of OLED display device in FIG. **7** is to perform re-detection of the OLED display device when an instruction from a user is received on the basis of the control method of FIG. **6**. In addition to providing test image to OLED display for detection when the OLED display device is turned on, the method can provide test image according to the default time or an instruction from a user to re-detect the decay of OLED display device. Therefore, the external image can be compensated in real time and the uneven display situation caused by decay of the OLED display device as time passes can be improved.

In summary, the present invention provides command for generating test image when the OLED display device is turned on, and according to the command to generate test image to detect the decay in displayed image in the OLED display device and generates corresponding compensation signal to compensate external image. The present invention further provides re-detection to an OLED display device when a default time is reached or an instruction from a user is received. As such, the present invention can compensate external image in real time according to command for generating test image and to improve the uneven display situation caused by decay of OLED display device as time passes.

Embodiments of the present invention have been described, but not intending to impose any unduly constraint to the appended claims. Any modification of equivalent structure or equivalent process made according to the disclosure and drawings of the present invention, or any application thereof, directly or indirectly, to other related fields of technique, is considered encompassed in the scope of protection defined by the claims of the present invention.

What is claimed is:

1. An organic light emitting diode (OLED) display device, which comprises: a display screen, a sensor, and a timing controller, wherein the display screen is configured to display an image and the sensor is configured to detect a decayed signal of the display screen when displaying;

wherein the timing controller comprises a detector, an external image receiver, a test image generator, a selector, a data compensator, and an image controller, the selector being connected to the detector, the external image receiver, and the test image generator and being also connected to the image controller;

wherein the detector is configured to provide a command for generating a test image;

the external image receiver is configured to receive an external image;

the test image generator is configured to generate a test image according to the command;

the selector is configured to select an input of the test image from the test image generator when receiving the command or to select an input of the external image from the external image receiver when not receiving the command, and then to feed the input to the image controller;

the image controller is configured to transmit the test image to the display screen for detecting decay of a display screen in response to the input of the test image; and

the data compensator is connected to the sensor and is configured to receive a decayed signal of the display screen detected by the sensor, the decayed signal corresponding to the test image transmitted from the image controller to the display screen, and to generate a compensation signal that is transmitted to the image controller; and

wherein when the image controller transmits the external image to the display screen, the external image is compensated according to the compensation signal so that the external image is displayed normally on the display screen.

2. The OLED display device as claimed in claim **1**, wherein the detector further comprises a power-on detection unit, and the power-on detection unit is configured to provide the command for generating a test image when the OLED display device is turned on.

3. The OLED display device as claimed in claim **2**, wherein the detector further comprises a timer unit and a storage unit that stores default time, the timer unit receiving the default time and providing the command for generating test image in response to the default time.

4. The OLED display device as claimed in claim **3**, wherein the detector further comprises an external activation unit, and the external activation unit is adapted to receive an

instruction from a user and in response thereto, provides the command for generating a test image.

5. The OLED display device as claimed in claim **1**, wherein the decayed signal is one of a voltage signal and a current signal; and where the data compensator is loaded therein a standard voltage signal or a standard current signal corresponding to the test image before inputting to display screen, then after the test image inputted to display screen, uses the sensor to detect the decayed voltage signal or decayed current signal corresponding to the test image, and determines the value of compensation signal according to the difference between the standard voltage signal and decayed voltage signal or the difference between the standard current signal and the decayed current signal.

6. The OLED display device as claimed in claim **1**, wherein the image controller further comprises an image duration control unit, which controls a duration of each of frames of the external image transmitted to the display screen according to the compensation signal.

7. The OLED display device as claimed in claim **1**, wherein the image controller further comprises a voltage generation unit, which generates a control voltage corresponding to the external image according to the compensation signal and transmits the control signal to the display screen.

* * * * *

专利名称(译)	OLED显示装置补偿图像衰减		
公开(公告)号	US9520080	公开(公告)日	2016-12-13
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摘要(译)

一种OLED显示装置，包括显示屏，传感器和时序控制器。定时控制器包括检测单元，测试图像生成单元，数据补偿单元和图像控制单元。检测单元提供用于生成测试图像的命令。测试图像生成单元根据命令生成测试图像。数据补偿单元接收对应于测试图像并由传感器检测到的衰减信号，以便根据衰减的信号产生补偿信号。响应于补偿信号，图像控制单元补偿外部图像，以实现外部图像在显示屏上的正常显示。