

- 1 -

METHOD AND APPARATUS FOR OVERLAYING IMAGES

DESCRIPTION

5

The present invention relates to an image overlaying method and an apparatus therefor, in which a part of a first image is overlaid with a portion of a second image.

10

Generally, an electronic colour overlaying apparatus includes an electronic pen and an electronic panel. The electronic pen is connected to a host controller, and the electronic pen moves over the electronic panel to draw figures or to add colours to the figures by moving the cursor on the monitor.

15

20

Referring to Figure 1, an electronic panel 1 includes a drawing part 2 for drawing figures and a colour selecting part 3 for selecting colours to give colour to the drawn figures. The colour selecting part 3 includes a plurality of parts corresponding to colours

such as a red colour part 3A, a yellow colour part 3B, a blue colour part 3C and a white colour part 3N. After a user has completed drawing a figure by using the electronic pen, the user can select suitable colours from
5 the colour selecting part 3.

Instead of colouring the figures by using an electronic pen, a technique of overlaying a particular image with another image has been developed. However, there is also a problem
10 with this technique in that the colours of the video signals are mixed and the original colours are not retained during the overlaying. For example, if an image of a red automobile is overlaid on an image of a green prairie, the resultant colour of the automobile is yellow.

15

The present invention is intended to overcome the above described disadvantages of conventional techniques.

According to the present invention, there is provided a
20 method of producing a video signal of an image comprising a portion of a first image overlaying a portion of a second image, comprising the steps of:

- (a) storing a first video image in a first memory means and storing a second video image in a second memory means;
- 25 (b) displaying the first video image on a display means;
- (c) defining an overlaying area of the displayed first

- video image in response to user input commands;
- (d) storing data defining the shape of the overlaying area in a third memory means;
 - (e) displaying the second video image on the display means;
 - 5 (f) superimposing a dummy image corresponding to the stored overlaying area data on the displayed second video image;
 - (g) locating the superimposed dummy image at a location in the displayed second video image in response to user
10 input commands;
 - (h) in response to a further user input command, replacing the dummy image portion of the displayed image with image data of the first video image from the overlaying area defined in step (c) to create an overlaid video
15 image; and
 - (i) generating a video signal from the overlaid video image data.

Conveniently, the control means displays the overlay area
20 data on the display means as an outline. Preferably, the outline is shown in white.

The present invention also provides an apparatus for overlaying video images, comprising first and second memory
25 means for storing first and second input video image data of first and second video images, third memory means, display

means for displaying video images, control means including a user command input means, and output means for outputting an overlaid video image, wherein the control means is arranged to perform a method as set out above.

5

Preferably, the user input means includes a graphics tablet. However, alternatives such as a mouse or a trackerball may be employed.

10 Preferably, there is provided synchronizing signal separating means for separating synchronizing signals from an input composite video signal to provide timing signals to the control means.

15 Conveniently, the control means includes a microprocessor.

Preferably, the first and second video images are stored in digital form.

20 An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 illustrates an electronic panel or graphics tablet
25 according to the prior art.

- (a) storing a first video image in a first memory means and storing a second video image in a second memory means;
- 5 (b) displaying the first video image on the display means;
- (c) defining an overlaying area of the displayed first video image in response to user input
10 commands;
- (d) storing data defining the shape of the overlaying area in a third memory means;
- 15 (e) displaying the second video image on the display means;
- (f) superimposing an image corresponding to the stored overlaying area data on the displayed
20 second video image;

- (g) locating the superimposed overlaying area image at a location in the displayed second video image in response to user input commands;
- 5 (h) in response to a further user input command, replacing image data of the second video image in the region identified by superimposing the overlaying area image in step (g) with image data of the first video image from the overlaying area defined in step (c) to create an overlaid video
10 image; and
- (i) generating a video signal from the overlaid video image data.

15

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

20

Figure 1 illustrates an electronic panel or graphics tablet according to the prior art;

Figure 2 is a block diagram of an image overlaying apparatus according to the present invention;

Figures 3A to 3D illustrate the procedure for
5 overlaying image data from separate memories; and

Figures 4A to 4C are flow charts of the procedure for
overlaying two different pictures according to the
present invention.

10

Referring to Figure 2, the apparatus comprises a first
analogue-to-digital converter 10 connected to a video
signal line for converting input composite video
signals to digital signals, a synchronizing signal
15 separator 12 connected to the video signal line for
separating out the vertical synchronizing signals and
the horizontal synchronizing signals of the input
composite video signals, an electronic panel, an
amplifier 21 connected to the electronic pen 19 for
20 amplifying signals read by the electronic pen 19, a
second analogue-to-digital converter 22 connected to
the amplifier 21 for converting amplified signals to
digital signals, a digital-to-analogue converter 13 for

converting output digital signals to analogue signals,
a first memory 15 and a second memory 16 for storing
picture data respectively, a third memory 17 for
storing closed curved line data by receiving addresses
5 defining the closed curved line, the closed curved line
being drawn by means of the electronic pen 19 after
pressing an image overlay key 18, and a microcomputer
11 connected to the respective elements for controlling
the first to the third memories 15, 16 and 17 for
10 overlaying a portion of the data of the first memory
15, as defined by data stored in the third memory 17,
on the data of the second memory 16.

Figures 3A and 3B illustrate each state in which the
15 picture data to be overlaid are stored respectively in
the memories 15 and 16.

Figure 3C illustrates the state in which positional
data of the pictures to be overlaid are stored and
20 Figure 3D illustrates the result of the overlaying of
the picture data of Figure 3A with the picture data of
Figure 3B.

In Figures 4A to 4C the first memory 15, the second memory 16 and the third memory 17 are indicated by MA, MB and MC, respectively.

5 Referring to Figure 4, the method for overlaying different pictures comprises pressing overlay key 18, steps S102 and S103 for carrying out normal operation in the absence of an input from the overlay key 18 and for detecting the occurrence of an input from the
10 overlay key 18, a discriminating step S104 for deciding whether the user is using the electronic pen 19, and if the electronic pen 19 is operating to store an address in the third memory 17 using the address of a first recognized position of the electronic pen 19 on the
15 electronic panel 20.

Furthermore, a discriminating step S107 is carried out for detecting address values varied in response to the movements of the electronic pen 19, and step S108 is
20 carried out for writing "1" into a relevant address of the third memory 17 if the address value is varied. A discriminating step S109 is carried out to decide whether a closed curved line has been completed along a

periphery of a part of a picture to be used as an overlay, so that step S110 is carried out to display the data of the second memory 16 on the monitor 14 if the line is completed and for returning the operation to step S107 if the closed curved line is not completed.

Subsequently, a discriminating step S111 decides whether the electronic pen 19 has moved so that steps S112 and S113 are carried out for checking addresses of the electronic panel 20 upon finding a movement of the electronic pen 19 to compute a functional relation between the address of the electronic panel 20 and the address of the second memory 16. Then, the closed curved line of the third memory 17 is displayed in white on the monitor 14 in a step S114.

The operation can be returned to the step S112 by step S115 arbitrarily moving the closed curved line on the picture of the second memory 16 with the electronic pen 19. Step S116 decides whether a picture end key 23 has been operated to finish the picture overlaying if no

further movement of the electronic pen 19 has been detected.

5 Step S117 is carried out for computing a functional value to overlay the desired data of the first memory 15 on the data of the second memory 16 and step S118 is carried out for making the row address and the column address of the first memory 15 "0".

10 A discriminating step S119 is carried out for checking the row and column addresses of the third memory 17, so that the column address is increased at a step S120 upon finding the zero row and column addresses. A discriminating step S121 is carried out for deciding
15 whether the column address has arrived at the final column address of the electronic panel 20, so that step S122 is carried out for returning the operation to the discriminating step S119 if the final column address has not been reached and for increasing the row
20 address if the final column address has been reached.

A discriminating step S123 is carried out for deciding whether the address has arrived at the final row address of the electronic panel 20, so that step S124 is carried out for terminating the program if the final
5 row address is reached and for making the column address "0" if the final row address has not been reached, thereby to return the operation to the discriminating step S119.

10 Steps S125 and S126 are carried out for overlaying the closed curved line of the first memory 15 to the second memory 16, and then, increasing the column address of the first memory 15 if the row and column addresses of the third memory 17 are respectively "1" at the step
15 S119.

The steps S125 and S126 are repeated after a step S127 if the row and column addresses of the third memory 17 are not "1", and the next column address is increased
20 at a step S128 by 1 if the row and column addresses are "1". Steps S129 and S130 are carried out for repeating the above steps until the final column address of the electronic panel 20 arrives and for increasing the row

address by 1 upon arriving to the final column address.

5 Steps S131 and S132 are carried out for checking the final row address of the electronic panel 20 and making the column address "0" if the final row address has not been reached in order to return to the discriminating step S119, and terminating the program upon finding the arrival to the final row address.

10

In the present invention as described above, as shown in Figure 2, the composite video signals are digitized by the first analogue-to-digital converter 10 and supplied to the microcomputer 11. The microcomputer 11
15 supplies a clock signal to the first analogue-to-digital converter 10, so that the first analogue-to-digital converter 10 is enabled and digital data is output.

20 Meanwhile, the synchronizing signal separator 12 separates out the vertical synchronizing signals V-SYNC and the horizontal synchronizing signals H-SYNC to supply to the microcomputer 11. Then the microcomputer

11 supplies the output data signals from the first
analogue-to-digital converter 10 through a data line to
the digital-to-analogue converter 13 for converting the
input digital signals to analogue signals to display
5 them on the monitor 14.

Meanwhile, if it is desired to overlay two pictures by
overlaying image data from the first memory 15 onto the
image data of the second memory 16, the user has to
10 press the image overlay key 18. The microcomputer 11
recognizes the key input and supplies an address signal
to the first memory 15.

In this case, the data signals stored in the first
15 memory 15 are supplied through a data line to the
microcomputer 11 and displayed on the monitor 14. When
the data signals from the first memory 15 are displayed
on the monitor 14, the user can draw a closed curved
line on the desired part of the picture with the
20 electronic pen 19 on the electronic panel 20, whilst
watching the monitor 14. If the closed curved line is
drawn on the electronic panel 20, signals for the
closed curved line are read by the electronic pen 19

and applied to the second analogue-to-digital converter 22 after being amplified by the amplifier 21.

5 Under this condition, the digital data signals for the closed curved line are supplied through the microcomputer 11 to the digital-to-analogue converter 13 and converted to analogue signals for displaying in white on the monitor 14.

10 In other words, the microcomputer 11 assigns white to the addresses of the positions recognized by the electronic pen 19, and the microcomputer 11 also supplies "1" to the same addresses of the third memory 17 for storing the closed curved line. If the closed
15 curved line is completed, the starting point of the closed curved line is designated as the reference point.

After setting up such a reference point, the user
20 inputs a signal to the microcomputer 11 to cause the data in the second memory 16 to be displayed on the monitor 14. Then the user moves the electronic pen 19 to scan it on the electronic panel 20 in such a manner

that the data of the third memory 17 can be overlaid on an arbitrary portion of the picture from the second memory 16. In other words, the data of the third memory 17 has an address distribution around the reference point of the third memory 17, by taking the current position of the electronic pen 19 as the reference point of the third memory 17.

Further, according to the address distribution of the third memory 17, white colour signals are supplied to the monitor 14 on which the data of the second memory 16 are displayed.

Accordingly, although the electronic pen 19 moves on the electronic panel 20, the data of the third memory 17 are overlaid on the picture of the second memory 16 by taking the current position of the electronic pen 19 as the reference point. Therefore, the data of the third memory 17 always keeps the same shape, i.e., the shape of the closed curved line. The contents of the third memory 17 move on the monitor 14 according to the movements of the electronic pen 19.

When the contents of the third memory 17 appear on the position where an overlay is to be made, the user moves the electronic pen 19 on the electronic panel 20 in such a manner that the desired data (the picture data enclosed by a closed curved line of the first memory 15) of the first memory 15 is overlaid (mapped) onto the second memory 16.

According to the functional relation between the reference point of the third memory 17 and the reference point of the second memory 16 (as input by means of the electronic pen 19), the data of the first memory 15 is overlaid on the data of second memory 16.

The process of overlaying the picture data is illustrated in Figure 3, in which figures 3A and 3B illustrate respective states in which picture data is respectively stored in the respective first and second memories 15 and 16 which correspond with the screen of the monitor one to one. Figure 3C illustrates only the positional data of the picture to overlay, and Figure 3D illustrates the result of the overlay of the picture data of Figure 3A on that of Figure 3B.

The third memory 17 contains only the positional information on the picture data to overlay, the information containing only "1" at the positions corresponding to the shape of the closed curved line drawn on the image of the first memory 15.

The location of "1"s is searched by increasing the row address starting from the first row and column addresses (1,1) and by increasing the column address starting from the row and column addresses (2,1), thereby making it possible to locate the "1"s in the third memory 17. If a "1" is found at N,M (the electronic panel 20 being assumed to have 256 rows x 715 columns), then the contents of the first memory 15 at N,M are overlaid on the second memory 16 according to the functional relation between the reference point of the third memory 17 and the reference point of the second memory 16 as input by means of the electronic pen 19.

Then the overlaying is continued by increasing the row address successively until "1" is found. That is, the overlaying is carried out according to the functional

relation between the reference point of the third memory 17 and the reference point of the second memory 16 as input by means of the electronic pen 19.

5 Then the column address is increased repeatedly in the same manner as described above until the desired portion of the contents of the first memory 15 is completely overlaid on the second memory 16 for completing the overlay of the picture data of the first
10 memory 15 on the picture data of the second memory 16.

Accordingly, the present invention gives a solution to the conventional problem that the original colour is
15 not retained, but is altered to another colour when a picture of a certain colour is overlaid on another picture of another colour.

Referring again to Figure 4, if the user presses the
20 image overlay key 18 (step S101), the program proceeds from step S101 to step S102, and if the image overlay key 18 is not pressed, the program proceeds from step S101 to step S103 to carry out the normal operation.

In the case where the image overlay key 18 is pressed, the picture data signals stored in the first memory 15 are displayed on the monitor 14 under the control of the microcomputer 11.

5

During such a display, if the user operates the electronic pen 19, the relevant address of the electronic panel 20 is checked (step S105), and the first recognized position of the electronic pen 19 is taken as reference points PR, PC respectively representing a reference point of the row address and a reference point of the column address, so that the reference points are stored in the third memory 17 (step S106).

15

If the user moves the electronic pen 19 on the electronic panel 20, the microcomputer 11 makes a judgment as to whether the value of the address has been varied (step S107), and a record of the track of the electronic pen 19 is stored in the relevant address of the third memory 17 in the form of value "1" (step S108).

20

Thereafter, when a closed curved line is completed along the periphery of a position of the picture from the first memory 15, the program proceeds from step S109 to step S110, and the monitor 14 displays
5 a picture corresponding to the picture data of the second memory 16.

If the user moves the electronic pen further (step S111), the microcomputer 11 recognizes it, and
10 checks its position (TR,TC) on the electronic panel 20 (step S112). Then the microcomputer 11 computes functions SR,SC formed between addresses TR,TC of the electronic panel 20 and addresses PR,PC of the first memory 15 (step S113).

15

Then the microcomputer 11 outputs all the addresses AR,AC corresponding to the shape of the closed curved line of the third memory 17 to the digital-to-analogue converter 13 by means of the electronic
20 pen 19 to overlay output data from the third memory 17 on the displayed picture of the second memory 16. Consequently, the closed curved line, corresponding to the outline of a portion of the image of the first memory 15, is displayed in white on the picture
25 of the second memory 16 displayed on the monitor 14.

Thereafter, if the electronic pen 19 is further moved on the picture of the second memory 16, the

program proceeds from step S115 to step S116. On the other hand, if the electronic pen 19 is not moved, the microcomputer 11 makes a judgment as to whether the picture overlaying process has finished.

- 5 If the user presses an overlay termination key 23, the microcomputer 11 recognizes it, and proceeds from step S116 to step S117 for overlaying the desired data from the first memory 15 on the data in the second memory 16 by computing functions XR, XC.
- 10 Under this condition, the row address DR and the column address DC of the first memory 15 come to have "0" (step S118).

Meanwhile, if the row and column addresses of the
15 third memory 17 have the same value of "0", first the program proceeds from step S119 to step S120 for increasing the column address. If the column address has not yet been reached the final column address 715 of the electronic

panel 20, the program returns from step S121 to step S119 for increasing the column address by one.

5 When the column address reaches 715, the program proceeds to step S122, and the microcomputer 11 increases the row address of the third memory 17 one by one.

10 During the increase of the row address, if the row address has a value other than 255, the program proceeds from step S123 to step S124 to clear the column address to "0" and returns to step S119.

15 Meanwhile, if the addresses DR,DC of the third memory 17 have a value of "1", the microcomputer 11 overlays the contents of the first memory 15 on the second memory 16 and increases the column address of the first memory 15 by one (step S125 and step S126).

20 Then the microcomputer 11 makes a judgment as to whether the column and row addresses have a value of "1". If they do not have a value of "1", the program returns from step S127 to step S125 to repeat the above

described steps S125 and S126, and if the column and row addresses of the third memory 17 have a value of "1", the next column address is increased by one (step S128).

5

Thereafter, when the column address reaches 715 by repeating the above described steps, the program proceeds from step S129 to step S130 for increasing the row address by one. If the row address has a value

10

other than 255, the microcomputer 11 sets the column address to "0" (step S131), and returns the program from step S132 to step S119 to repeat the above described steps. However, if the row address has a value corresponding to 255, the execution of the

15

program is terminated.

CLAIMS

1. A method of producing a video signal of an image comprising a portion of a first image overlaying a
5 portion of a second image, comprising the steps of:
- (a) storing a first video image in a first memory means and storing a second video image in a second memory means;
 - (b) displaying the first video image on a display means;
 - 10 (c) defining an overlaying area of the displayed first video image in response to user input commands;
 - (d) storing data defining the shape of the overlaying area in a third memory means;
 - (e) displaying the second video image on the display
15 means;
 - (f) superimposing a dummy image corresponding to the stored overlaying area data on the displayed second video image;
 - (g) locating the superimposed dummy image at a location
20 in the displayed second video image in response to user input commands;
 - (h) in response to a further user input command, replacing the dummy image portion of the displayed image with image data of the first video image from
25 the overlaying area defined in step (c) to create an overlaid video image; and
 - (i) generating a video signal from the overlaid video image data.



2. A method according to claim 1, wherein the dummy image comprises the outline of the overlaying area.
3. A method according to claim 2, wherein the outline
5 is white.
4. A method according to claim 1, 2 or 3, wherein the first and second video images are stored in digital form.
- 10 5. An apparatus for overlaying video images, comprising first and second memory means for storing first and second input video image data of first and second video images, third memory means, display means for displaying video images, control means including a user command
15 input means, and output means for outputting an overlaid video image, wherein the control means is arranged to perform a method according to any one of claims 1 to 4.
6. An apparatus according to claim 5, wherein the user
20 command input means includes a graphics tablet.
7. An apparatus according to claim 5 or 6, including synchronizing signal separating means for separating synchronizing signals from an input composite video
25 signal to provide timing signals to the control means.
8. An apparatus according to claim 5, 6 or 7, wherein the control means includes a microprocessor.



9. A method of overlaying video images substantially as hereinbefore described with reference to Figures 2 to 4 of the accompanying drawings.

5 10. An apparatus for overlaying video images substantially as hereinbefore described with reference to Figures 2 to 4 of the accompanying drawings.

