

Description

This invention relates to trigger field handling in display apparatus, whereby, for example, in a display driven data processing system, it becomes possible to enable subroutine selection without committing display space to the same.

It is known that during run-time presentations of display images in a data processing system (e.g. a personal computer), an image zone ("trigger field") can be selected by a user moving a cursor to the field, under control of a mouse or keyboard keys. Such trigger fields may correspond to displayed icons, portions of an image, areas around significant words, etc. Depending upon the user's selection of a trigger field, different program paths can be implemented, subroutines activated, or other processing functions controlled. For example, an icon of a cat may lead to one story path, while an icon of a dog may lead to a different path. To enable this selectivity, the image must have the trigger field identified in advance so that the placement of a cursor therein enables the selection of the particular story path.

Characteristically, trigger fields are marked on the display so that the user knows where to move the cursor to make the selection. Of necessity, the trigger fields are kept relatively small so that the field demarcations do not occupy significant space on the display. This then requires the user to move the cursor, with some precision, to assure that the cursor overlaps the trigger field. Cursor "overshoots" and "undershoots" are common and require time consuming adjustment by the user to assure proper cursor/trigger field alignment.

UK Patent Application GB 2181627 discloses such a display in which the user selects one of a plurality of specified portions of the screen by pointing towards that portion of the screen. The portions of the screen are highlighted as trigger fields.

For optimum user interaction, it is desirable to make trigger fields as large as possible, but then the image becomes cluttered. This results in a larger problem when it is desired to have many trigger fields overlapping various portions of an image. For instance, if an image of an aeroplane is displayed, and it desired to enable the user to select any of the main aircraft subassemblies, e.g. wings, tail, fuselage etc., and then display a blown-up image of the selected portion, the placement of visible trigger fields can significantly clutter the image and may obscure structural features.

Accordingly, the present invention, as defined in the Claims, provides a display apparatus, comprising storage means for storing an image and trigger fields associated with the image, a display, means for indicating a cursor on the display, and means for moving the cursor and enabling a select operation, characterised in that the apparatus further comprises means

for altering the cursor between a first and a second configuration, wherein the arithmetic logic means detects the movement of the cursor by the cursor moving means into and out of a trigger field and causes the cursor altering means to correspondingly alter the cursor to the first and to the second configuration, and the trigger fields are buried and not displayed.

The invention also provides a method of indicating to a user pre-defined trigger fields on a display, for use in a display apparatus comprising storage means for storing an image and trigger fields associated with the image, a display, means for indicating a cursor on the display and cursor moving means for moving the cursor, the method comprising the step of displaying an image on the display, but not the associated trigger field, characterised in that the display apparatus further comprises cursor altering means to alter the cursor between a first and a second configuration, and the method further comprises the step of altering the cursor on the display from a second configuration to a first configuration upon the cursor being moved into one of said associated trigger fields, to thereby indicate to a user the presence of the trigger field.

This arrangement of invisible or non-displayed "buried" trigger fields can be thought of as providing a real display space and a virtual trigger field space, though physical memory is required for each, and causing the cursor to exist in the same relative position in each space. This enables one to provide a display with trigger fields which facilitate user selection but which do not clutter the image.

The present invention will be described further by way of example with reference to an embodiment thereof as illustrated in the accompanying drawings, in which

Fig. 1 is a high level block diagram of a display processor adapted to handle buried trigger fields; Fig. 2 is an example of a display screen showing the placement of images and trigger fields; Fig. 3 is an illustration of two cursor configurations that can be used;

Fig. 4 is a high level flow diagram illustrating the process for creating an invisible trigger field on a display image; and

Fig. 5 is a high level flow diagram illustrating the operation of the display processor.

Referring now to Fig. 1, a block diagram is shown of portions of a data processing system having display capability. As is known, the processor comprises arithmetic/logic unit 10 coupled to a bus (or buses) 12 to which are also coupled a plurality of memory modules. While the memory modules to be hereinafter described, are shown as independent memories, it is to be understood that they would generally be configured as portions of a larger random access memory rather than as independent modules.

World plane image memory 14 contains the stor-

age for pixels of a pre-determined size image. Viewport image memory 16 contains sufficient pixel storage for a single screen on a display. Trigger field memory 18 is a memory area which provides storage for user-defined trigger fields which are overlayed on world plane image memory 14. Also connected to bus 12 is a display 20 with a keyboard 22. A cursor control input 24 to keyboard 22 may be provided from a mouse or other known cursor control implement. In addition, keyboard 22 is provided with cursor control direction keys which also enable the movement of the cursor on display 20.

The operation of the system shown in Fig. 1 is conventional in that arithmetic logic unit 10 provides to world plane image memory 14, an image from a scanner or other input device (not shown). A portion of the world plane image in memory 14 is then fed to viewport image memory 16 and then to display 20, for user viewing. World plane image memory 14 contains an image which is larger (e.g., 1024 by 1024 pixels) than can be shown on a pixel per pixel basis on display 20. Thus, viewport image memory 16 is provided with the exact number of pixels which can be displayed in one screen (e.g., 640 by 480 pixels).

An exemplary screen to be displayed on display 20 is shown in Fig. 2. Screen 30 contains a view of an aeroplane 32 which is in turn, provided with wings, fuselage, landing gear etc. A window 34 is shown at the upper left of screen 30 and contains three selectable subroutines. The "edit" routine may be selected to alter the showing of one or more portions of aeroplane 32. The "display" routine may cause a particular selected portion of the aeroplane to be displayed individually on the screen. The "zoom" routine enables a particular feature of the aeroplane to be enlarged for viewing.

A cursor 36 is movable on screen 30 in either the horizontal or vertical direction. A plurality of trigger fields 38, 40, 41, 42 and 44 are shown encompassing various portions of aeroplane 32. The placement of cursor 36 within the boundaries of any of the aforementioned trigger fields and a user's subsequent actuation of an appropriate keyboard key, will cause the actuation of a particular subroutine related to the trigger field in accordance with the routine chosen by the user in pull down window 34. For instance, if the user actuates pull down 34, and positions a cursor within any of boxes 50, 52 or 54, the associated subroutine is then enabled to be performed upon a selected portion of aeroplane 32 which is encompassed by the chosen trigger field. The subsequent placement of cursor 36 within a selected trigger field, and its selection, causes that portion of the aeroplane to be acted upon, as determined by the user selected routine from pull-down 34.

It should be noted that irregularly shaped trigger fields can be created by overlapping them as shown by trigger fields 40 and 41. In such a case, ascribing

the same name to both fields enables the selection of either one to access the subroutines for both.

Prior art systems have required that cursor 36 be placed within boxes 50, 52 and/or 54 to enable the selection of one or more of the indicated functions. In addition, trigger fields 38, 40, 42, etc. have been required to be shown on the face of the display to enable the user to know where to position cursor 36 to enable selection of the particular portion of the airframe, upon which the function is to be carried out.

Referring now to Fig. 3, two forms of cursor 36 are shown. Cursor 36 is a cross which is movable across the face of screen 30 by a directional cursor control. Cursor 36' is a second configuration of cursor 36 which is automatically displayed when cursor 36 is placed within a trigger field. As will be hereinafter understood, during the operation, none of trigger fields 38, 40, 42 and 44 are shown on screen 30. In addition, in lieu of employing trigger boxes 50, 52 and 54, the areas encompassing the edit, display and zoom function indications can be employed as trigger fields. For instance, the area beneath line 60 and above line 62 can be used as the trigger field for the zoom function.

Referring to Fig. 4, the manner in which the various trigger fields are inserted is now described. The trigger field "edit" operation commences by ALU 10 causing display 20 to display a world plane image, as well as initialising the position of cursor 36 on screen 30 (box 100). The user then views screen 30 and the displayed world plane image and decides where trigger fields are to be established. To establish a first trigger field, the user positions cursor 36 at a corner of a desired trigger field and draws a line to another point to establish a limit of the trigger field (box 102). As is known, this action is shown on screen 30 by a line, which line may be differentiated from other world plane image lines by either making it a different colour, making it dotted, etc.

If at the termination of the creation of a field limit, there is no user key entry that a full trigger field has been established, then the program recycles to enable other field limits to be inserted decision box 104. If, on the other hand, a user key entry is sensed indicating that the field has been defined, the thus created trigger field is stored to trigger field memory 18 (box 106). A name is then assigned to the stored trigger field and is noted in trigger field memory 18 (box 108). Similarly, the same name is assigned to an associated subroutine which will be enabled when the specific trigger field is selected (box 110). The selection of a trigger field subsequently occurs as the result of a user positioning cursor 36 within its limits and actuating a "select" or "enter" key on keyboard 22.

Once all trigger fields have been created (decision box 112); the routine exits with all of the field limits stored in trigger field memory 18. If more fields remain to be created, the program recycles to enable their creation. The displayed world plane image with

trigger fields overlayed is then returned to a separate storage area for later viewing, if desired. The original world plane image still remains in world plane image memory 14 without the trigger fields indicated thereon.

Turning now to Fig. 5, the operation of the system, in combination with invisible trigger fields, will be described. Initially, the user selects a viewport from the world plane image stored in world plane image memory 14. The viewport may be all of the world plane image or just a portion thereof (box 120). Depending upon the selected viewport, the trigger fields stored within trigger field memory 18 are tested to determine if they fall within the confines of the selected viewport. If so, they are enabled for subsequent interrogation (box 122).

The system then displays the viewport with no trigger fields indicated (box 124). At the same time a cursor is also displayed and, immediately, a determination is made as to whether the cursor is or is not within a trigger field (box 126). If it is found not to be within a trigger field, a cursor configuration, such as shown at 36 in Fig. 3, is displayed (box 128). If the cursor is found to be within a trigger field, a cursor image, such as is shown in Fig. 3 at 36', is displayed (box 130). If the first cursor configuration (36) is displayed, the user understands that no trigger field select operation is possible and the user may then continue to move the cursor about the display screen. If the second cursor configuration (36') is evidenced on the screen, the user may, if desired, select the particular trigger field in which the cursor is positioned (box 132). If the user does not indicate a selection of that trigger field, the position of the cursor is subsequently again tested (box 134) to determine if it still remains within the trigger field. If it is found to be still within the specific trigger field, the program recycles to determine if the user has selected the field. If the cursor is found to have moved out of the trigger field, the cursor display is then changed back to the first configuration (i.e. Fig. 3 - cursor 36) and the program recycles as shown in Fig. 5 (box 136).

If the user actuates a select key (box 132) while the second cursor configuration is showing, the name of the trigger field in which the cursor is positioned is accessed (box 138), and the subroutine with the identical name is also accessed and brought into action (boxes 140, 142).

ALU 10, in determining whether the cursor is positioned over a trigger field, notes the position of the cursor and compares it with each of the enabled trigger fields stored within trigger field memory 18. It is the outcome of that comparison which enables the cursor image to either be displayed as cursor 36 or cursor 36'. It can thus be seen that the user is enabled by a simple change of cursor configuration, to identify the presence of invisible trigger fields and to actuate a subroutine associated therewith.

Claims

1. A display apparatus, comprising:
 - storage means (14,18) for storing an image and trigger fields (38,40,41,42) associated with the image;
 - a display (20);
 - means for indicating a user-controlled cursor (36) on said display; and
 - means (24) for moving said user-controlled cursor (36) and enabling a select operation;
 - the apparatus characterised in that it further comprises:
 - means (24) for altering said user-controlled cursor between a first (36') and a second (36) configuration; and
 - means for detecting the movement of said cursor (36) by said cursor moving means into and out of a stored trigger field and causing said cursor altering means to alter said cursor to said first (36') and to said second (36) configuration, respectively; and
 - wherein said trigger fields (38,40,41,42) are not displayed.
2. An apparatus as claimed in claim 1, wherein said select operation is enabled when said cursor altering means alters said cursor to said first (36') configuration.
3. An apparatus as claimed in claim 2, wherein said select operation is a subroutine associated with a corresponding trigger field.
4. A method of indicating to a user predefined trigger fields on a display, for use in the display apparatus as defined in Claim 1, comprising the steps of:
 - storing an image and trigger fields associated with said image in a storage means;
 - displaying (124) said stored image on said display (20) whereby said associated trigger fields are not displayed;
 - indicating/moving said cursor (36) on said display (20) in response to a user's instructions;
 - enabling a select operation;
 - the method characterised in that it further comprises the steps of:
 - detecting the movement of said cursor (36) by a cursor movement means (24) into and out from a stored trigger field; and
 - altering (128, 130) said cursor (36) on said display (20) between a first (36') and a second (36) configuration upon said cursor (36) being moved into or out of one of said associated trigger fields, to there by indi-



trigger fields overlayed is then returned to a separate storage area for later viewing, if desired. The original world plane image still remains in world plane image memory 14 without the trigger fields indicated thereon.

Turning now to Fig. 5, the operation of the system, in combination with invisible trigger fields, will be described. Initially, the user selects a viewport from the world plane image stored in world plane image memory 14. The viewport may be all of the world plane image or just a portion thereof (box 120). Depending upon the selected viewport, the trigger fields stored within trigger field memory 18 are tested to determine if they fall within the confines of the selected viewport. If so, they are enabled for subsequent interrogation (box 122).

The system then displays the viewport with no trigger fields indicated (box 124). At the same time a cursor is also displayed and, immediately, a determination is made as to whether the cursor is or is not within a trigger field (box 126). If it is found not to be within a trigger field, a cursor configuration, such as shown at 36 in Fig. 3, is displayed (box 128). If the cursor is found to be within a trigger field, a cursor image, such as is shown in Fig. 3 at 36', is displayed (box 130). If the first cursor configuration (36) is displayed, the user understands that no trigger field select operation is possible and the user may then continue to move the cursor about the display screen. If the second cursor configuration (36') is evidenced on the screen, the user may, if desired, select the particular trigger field in which the cursor is positioned (box 132). If the user does not indicate a selection of that trigger field, the position of the cursor is subsequently again tested (box 134) to determine if it still remains within the trigger field. If it is found to be still within the specific trigger field, the program recycles to determine if the user has selected the field. If the cursor is found to have moved out of the trigger field, the cursor display is then changed back to the first configuration (i.e. Fig. 3 - cursor 36) and the program recycles as shown in Fig. 5 (box 136).

If the user actuates a select key (box 132) while the second cursor configuration is showing, the name of the trigger field in which the cursor is positioned is accessed (box 138), and the subroutine with the identical name is also accessed and brought into action (boxes 140, 142).

ALU 10, in determining whether the cursor is positioned over a trigger field, notes the position of the cursor and compares it with each of the enabled trigger fields stored within trigger field memory 18. It is the outcome of that comparison which enables the cursor image to either be displayed as cursor 36 or cursor 36'. It can thus be seen that the user is enabled by a simple change of cursor configuration, to identify the presence of invisible trigger fields and to actuate a subroutine associated therewith.

Claims

1. A display apparatus, comprising:
 - storage means (14,18) for storing an image and trigger fields (38,40,41,42) associated with the image;
 - a display (20);
 - means for indicating a user-controlled cursor (36) on said display; and
 - means (24) for moving said user-controlled cursor (36) and enabling a select operation;
 the apparatus characterised in that it further comprises:
 - means (24) for altering said user-controlled cursor between a first (36') and a second (36) configuration; and
 - means for detecting the movement of said cursor (36) by said cursor moving means into and out of a stored trigger field and causing said cursor altering means to alter said cursor to said first (36') and to said second (36) configuration, respectively; and
 - wherein said trigger fields (38,40,41,42) are not displayed.
2. An apparatus as claimed in claim 1, wherein said select operation is enabled when said cursor altering means alters said cursor to said first (36') configuration.
3. An apparatus as claimed in claim 2, wherein said select operation is a subroutine associated with a corresponding trigger field.
4. A method of indicating to a user predefined trigger fields on a display, for use in the display apparatus as defined in Claim 1, comprising the steps of:
 - storing an image and trigger fields associated with said image in a storage means;
 - displaying (124) said stored image on said display (20) whereby said associated trigger fields are not displayed;
 - indicating/moving said cursor (36) on said display (20) in response to a user's instructions;
 - enabling a select operation;
 the method characterised in that it further comprises the steps of:
 - detecting the movement of said cursor (36) by a cursor movement means (24) into and out from a stored trigger field; and
 - altering (128, 130) said cursor (36) on said display (20) between a first (36') and a second (36) configuration upon said cursor (36) being moved into or out of one of said associated trigger fields, to there by indi-



cate to a user the presence of said associated trigger field.

5. A method as claimed in claim 4, further comprising the step of enabling a select operation upon the cursor being altered to said first (36') configuration.
6. A method as claimed in claim 5, wherein said select operation is a subroutine associated with a corresponding trigger field.

Patentansprüche

1. Ein Anzeigegerät, das:
Speichereinrichtungen (14, 18) zum Speichern eines Abbilds und zu dem Abbild gehörender Triggerbereiche (38, 40, 41, 42);
eine Anzeige (20);
Einrichtungen zum Anzeigen eines vom Benutzer gesteuerten Cursors (36) auf der Anzeige;
und
Einrichtungen (24) zum Bewegen des vom Benutzer gesteuerten Cursors (36) und zum Aktivieren einer Auswahloperation umfaßt,
wobei das Gerät dadurch gekennzeichnet ist, daß es desweiteren
Einrichtungen (24) zum Ändern des vom Benutzer gesteuerten Cursors zwischen einer ersten (36') und einer zweiten (36) Konfiguration; und
Einrichtungen zum Erfassen der Bewegung des Cursors (36) durch die Cursor-Bewegungseinrichtungen in einen gespeicherten Triggerbereich und aus diesem heraus und zum Veranlassen der Cursor-Änderungseinrichtungen, damit diese den Cursor jeweils in die erste (36') und die zweite (36) Konfiguration ändern, umfaßt und
wobei die Triggerbereiche (38, 40, 41, 42) nicht angezeigt werden.
2. Ein Gerät nach Anspruch 1, wobei die Auswahloperation aktiviert wird, wenn die Cursor-Änderungseinrichtung den Cursor in die erste (36') Konfiguration ändert.
3. Ein Gerät nach Anspruch 2, wobei der Auswahloperation eine Unteroutine mit einem entsprechenden Triggerbereich zugeordnet ist.
4. Ein Verfahren zum Verweisen auf von einem Benutzer zuvor definierte Triggerbereiche auf einer Anzeige für die Verwendung im in Anspruch 1 definierten Anzeigegerät, das die Schritte umfaßt zum:
 - Speichern eines Abbilds und von zu dem Abbild gehörender Triggerbereiche in einer Speichereinrichtung;

- Anzeigen (124) des gespeicherten Abbilds auf der Anzeige (20), wobei die zugehörigen Triggerbereiche nicht angezeigt werden;

- Anzeigen/Bewegen des Cursors (36) auf der Anzeige (20) in Abhängigkeit der Anweisungen eines Benutzers;

- Aktivieren einer Auswahloperation;

wobei das Verfahren dadurch gekennzeichnet ist, daß es desweiteren die Schritte umfaßt zum:

- Erfassen der Bewegung des Cursors (36) in einen gespeicherten Triggerbereich oder aus diesem heraus durch eine Cursor-Bewegungseinrichtung (24); und

- Ändern (128, 130) des Cursors (36) auf der Anzeige (20) zwischen einer ersten (36') und einer zweiten (36) Konfiguration, wenn der Cursor (36) in einen der zugehörigen Triggerbereiche oder aus einem dieser zugehörigen Triggerbereiche heraus bewegt wird, um dadurch einem Benutzer das Vorhandensein des zugehörigen Triggerbereichs anzuzeigen.

5. Ein Verfahren nach Anspruch 4, das desweiteren den Schritt zum Aktivieren einer Auswahloption umfaßt, wenn der Cursor in die erste (36') Konfiguration geändert wird.

6. Ein Verfahren nach Anspruch 5, wobei es sich bei der Auswahloperation um eine Unteroutine handelt, die einem zugehörigen Triggerbereich zugeordnet ist.

Revendications

1. Appareil de visualisation, comprenant :
des moyens de stockage (14, 18) pour stocker une image et des zones de déclenchement (38, 40, 41, 42) associées à l'image ;
un affichage (20) ;
des moyens pour indiquer un curseur (36) placé sous la commande d'un utilisateur, sur ledit affichage ;
un moyen (24), pour déplacer ledit curseur (36) placé sous la commande d'un utilisateur et permettre une opération de sélection ;
l'appareil étant caractérisé en ce qu'il comprend en outre :
un moyen (24) pour modifier le curseur placé sous le contrôle d'un utilisateur, entre une première (36') et une deuxième (36) configuration ;
et
un moyen pour détecter le déplacement dudit curseur (30), par ledit moyen de déplacement de curseur, lorsqu'il y a pénétration et sortie d'une zone de déclenchement sélectionnée et faisant que le-



- dit moyen de modification de curseur modifie ledit curseur passant à ladite première (36') et à ladite deuxième (36) configuration, respectivement ; et
dans lequel lesdites zones de déclenchement (38, 40, 41, 42) ne sont pas affichés. 5
2. Appareil selon la revendication 1, dans lequel ladite opération de sélection est autorisée lorsque le moyen de modification de curseur assure la modification dudit curseur passant à ladite première configuration (36'). 10
3. Appareil selon la revendication 2, dans lequel ladite opération de sélection est un sous-programme associé à une zone de déclenchement correspondante. 15
4. Procédé d'indication à un utilisateur de zones de déclenchement prédéterminés sur un affichage, pour utilisation dans l'appareil de visualisation selon la revendication 1, comprenant les étapes de : 20
- stockage d'une image et de zones de déclenchement associées à ladite image dans un moyen de stockage ; 25
 - affichage (124) de ladite image à stocker sur ledit affichage (20), de manière que lesdites zones de déclenchement associées ne soient pas affichées ; 30
 - indication/déplacement dudit curseur (36) sur ledit affichage (20), en réponse à des instructions de l'utilisateur ; 35
 - autorisation d'une opération de sélection ; le procédé étant caractérisé en ce qu'il comprend en outre les étapes de : 40
 - détection du déplacement dudit curseur (36) par un moyen de déplacement de curseur (24), le faisant passer à l'intérieur et à l'extérieur d'une zone de déclenchement stockée ; et 45
 - modification (128, 130) dudit curseur (36) sur ledit affichage (20), entre une première (36') et une deuxième (36) configuration, lorsque ledit curseur (36) est déplacé pour entrer dans, ou sortir de, l'une desdites zones de déclenchement associées, de manière à indiquer à un utilisateur la présence de ladite zone de déclenchement associée. 50
5. Procédé selon la revendication 4, comprenant en outre l'étape d'autorisation d'une opération de sélection lorsqu'il y a modification du curseur, le faisant passer à ladite première configuration (36'). 55
6. Procédé selon la revendication 5, dans lequel ladite opération de sélection est un sous-