(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
10 January 2002 (10.01.2002)

PCT

(10) International Publication Number
WO 02/03186 A2

(51) International Patent Classification[7]: G06F 3/00

(21) International Application Number: PCT/US01/19921

(22) International Filing Date: 21 June 2001 (21.06.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/607,803 30 June 2000 (30.06.2000) US

(71) Applicant *(for all designated States except US)*: **INTEL CORPORATION** [US/US]; 2200 Mission College Boulevard, Santa Clara, CA 95052 (US).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **RAMAKESAVAN, Sundaram** [CA/US]; 5189 West Saragosa Street, Chandler, AZ 85226 (US).

(74) Agents: **MALLIE, Michael, J.** et al.; Blakely Sokoloff Taylor & Zafman, 12400 Wilshire Blvd., Los Angeles, CA 90025 (US).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

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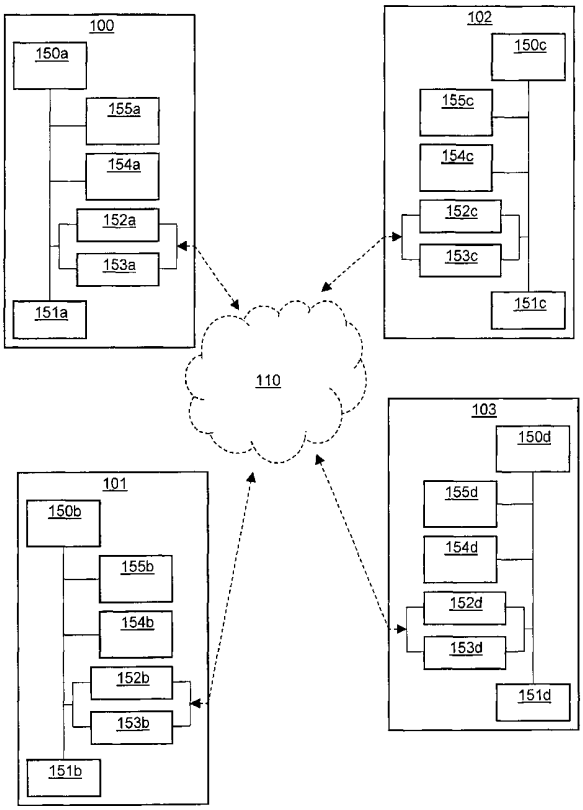
(54) Title: METHOD AND APPARATUS FOR USING AN INPUT DEVICE OF A FIRST COMPUTER SYSTEM TO WIRELESSLY ENTER DATA INTO A SECOND COMPUTER SYSTEM



(57) Abstract: A first computer system may be in one of two modes of operation, a non-channeling mode or a channeling mode. When the first computer system is in a non-channeling mode, information entered by a user via an input device coupled to the first computer system is interpreted as input data intended for the first computer system. When the first computer system is in a channeling mode, the information is interpreted as input data intended for a second computer system, and the first computer system wireless transmits the information to the second computer system in real time. In this manner, a user may, for example, use a mouse of the first computer system to control cursor movement on a display screen of the second computer system. This may be found useful for transferring information between the two computer systems, such as from a desktop computer to a handheld device.

WO 02/03186 A2

Published:

— *without international search report and to be republished upon receipt of that report*

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METHOD AND APPARATUS FOR USING AN INPUT DEVICE OF A FIRST COMPUTER SYSTEM TO WIRELESSLY ENTER DATA INTO A SECOND COMPUTER SYSTEM

The present invention relates to computer systems and more particularly to wireless communication between computer systems to enable data transferring between the computer systems.

BACKGROUND

*Computer systems, from small handheld electronic devices to medium-*sized mobile and desktop systems to large servers and workstations, are becoming increasingly pervasive in our society. Computer systems typically include one or more processors. A processor manipulates and controls the flow of data in a computer by executing instructions.

Currently, communication protocols are being developed to enable different types of computer systems to communicate with each other, allowing for a rapid exchange of data. Enabling this type of communication among computer systems may greatly enhance our efficiency. Unfortunately, establishing a communication link and exchanging data between computer systems may be a complex, time consuming, and unintuitive task. Because of this, when it comes to downloading some types of information, particularly short text data such as names, addresses, and phone numbers, from one computer system to another, many people resort to transferring this type of information by hand. This can reduce work efficiency.

The present invention addresses this and other problems associated with *the prior art.*

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is illustrated by way of example and not limitation in the accompanying figures in which like references indicate similar elements and in which:

Figure 1 is a wireless network coupling various computer systems in accordance with an embodiment of the present invention;

Figure 2 is a flow chart showing a method of the present invention; and

Figures 3a and 3b show the display screens of two computer systems in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION

In accordance with an embodiment of the present invention, a computer system may be in one of two modes of operation, a non-channeling mode or a channeling mode. "Channeling" is using one or more input devices of a first computer system to wirelessly enter information into a second computer system in real time. When the first computer system is in a non-channeling mode, information entered by a user via an input device coupled to the first computer system is interpreted as input data intended for the first computer system. When the first computer system is in a channeling mode, the information entered by the user via the input device is interpreted as input data intended for a second computer system.

When the first computer system is in the channeling mode, the information entered by the user is wirelessly transmitted in accordance with a short-range wireless communication protocol via a short-range transmitter coupled to the first computer system. This information is received by a short range receiver coupled

to the second computer system and is used as input data to the second computer system. In other words, from the user's perspective, when the first computer system is in the channeling mode, one or more input devices of the first computer system operate as one or more surrogate input devices of the second computer system.

In this manner, a user may, for example, use a mouse of a desktop or mobile computer to control cursor movement on a display screen of a handheld device such as a personal data assistant (PDA). As another example, a user may use the keyboard of the desktop or mobile computer to enter information, in real time, into the PDA. Note that the PDA may be a pen-based data entry device and may not otherwise include a port into which one could directly plug an electrical coupling to a mouse or keyboard.

A more detailed description of embodiments of the present invention, including various configurations and implementations, is provided below.

Figure 1 is a wireless network coupling various computer systems, 100-103, in accordance with an embodiment of the present invention. Each computer system includes a processor, 150a-150d, coupled to memory 151a-151d, a display screen, 155a-155d, and an input device, 154a-154d. Each computer system additionally includes a wireless communication transceiver coupled to the processor, the transceiver comprising a wireless communication transmitter, 152a-152d, and a wireless communication receiver, 153a-153d.

In accordance with an embodiment of the present invention, a processor may be a general purpose processor or any other type of data processor such as a micro-controller or digital signal processor (DSP). The memory of a computer

system may include one or more volatile and/or non-volatile storage devices. In accordance with one embodiment of the present invention, software is stored in the memory region that, when executed by the computer system, causes the computer system to implement a method of the present invention. Alternatively, the software may be stored elsewhere and transferred to the computer system via a carrier wave medium.

Computer systems 100-103 of Figure 1 may be any type of computer system such as a mobile computer system (e.g. a notebook or laptop computer system), a handheld device (e.g. a PDA), a desktop system, a cellular phone, or any other type of electronic device. Note that the computer systems need not be all of the same type of system or include the same type of processor, memory, input devices, or any other components. For example, computer system 100 may be a mobile system with input device 154a being a mouse while computer system 101 is a PDA with input device 154b being a touch-sensitive pen-based input system. Likewise, system 102 may be a server or workstation while system 103 is a cellular phone.

Each of computer systems 100-103 of Figure 1 is coupled to one another via wireless network 110. Wireless network 110 may be any type of wireless communication protocol. Although wireless network 110 is shown in Figure 1 supporting four computer systems, a wireless network in accordance with an alternate embodiment of the present invention may support any number of computer systems.

For one embodiment of the present invention, the wireless protocol implemented by wireless network 110 is a short-range wireless communication

protocol. A short-range wireless communication protocol is a protocol that is designed for communication between electronic devices having a separation of approximately fifty meters or less. As will be seen below, in accordance with one embodiment of the present invention, the present invention is implemented by a single user that can simultaneously operate one or more input devices of a first computer system while observing a display screen of a second computer system. For this embodiment, a short-range wireless communication protocol may operate over a distance of less than approximately ten meters.

For example, for one embodiment of the present invention, the wireless communication protocol implemented by wireless network 110 may be the Bluetooth* protocol described in the Bluetooth Specification, Version 1.0A, released July 24, 1999. For another embodiment, the wireless communication protocol may be the HomeRF* protocol described in the Shared Wireless Access Protocol (SWAP) Specification 1.0, released January 5, 1999. Other communication protocols may be used, however. (*Trademarks and brands are the property of their respective owners.)

Figure 2 is a flow chart showing a method of the present invention. At step 210, a user of a first computer system manipulates a mouse coupled to the first computer system to select a portion of text of a first document on a display screen of the first computer system. The selected portion of text is the text that the user wishes to transfer to another computer system. The document may be, for example, a word processor document that is viewable on the computer screen in a word processor application on the first computer. The text portion may be selected by highlighting the desired portion using the mouse or other pointing

device. For an alternate embodiment of the present invention, any portion of a document, including, for example, graphics or sound data, may be selected by the user for transfer to another computer system.

Figure 3a shows a screen shot of selected text 304 on display screen 302 of first computer system 301 in accordance with an embodiment of the present invention. Mouse 303, used to select text 304, is also shown coupled to computer system 301. In accordance with an alternate embodiment of the present invention, the selection of text may be made using an alternate input device. For example, a keyboard or pen-based device may be used, or a microphone in conjunction with a software program that can convert speech into control commands.

Next, at step 215 of Figure 2, the user drags selected text 304 of Figure 3a to icon 305. Icon 305 graphically represents a second computer system coupled to the same wireless network to which computer system 301 is coupled. The second computer system is shown in Figure 3a as computer system 311. For an alternate embodiment of the present invention, additional icons representing other computer systems within the wireless range of computer system 301 may appear on display screen 302. This embodiment allows the user to determine the computer system to which the selected text may be sent by dragging the selected text to the corresponding icon. Alternatively, the computer system to which the selected text may be sent may be selected from a menu displayed on display screen 302 of computer system 301.

Next, at step 220 of Figure 2, icon 313 of Figure 3a appears on display screen 312 of computer system 311. Icon 313 graphically represents selected text 304 on display screen 302 of computer system 301.

At step 225 of Figure 2, computer system 301 is placed in a channeling mode. In this mode, further information received from the user via mouse 303 (i.e. mouse movements) are channeled to computer system 311 of Figure 3b in real time via a short-range wireless connection between the two computer systems. For one embodiment of the present invention, computer system 301 is placed in a channeling mode automatically after the user drags selected text 304 to icon 305. For another embodiment of the present invention, computer system 301 is placed in a channeling mode in response to the user either pressing or releasing one or more buttons or keys of one or more input devices coupled to either computer system 301 or 311.

At step 230 of Figure 2, the user manipulates mouse 303 of Figure 3b to drag and drop icon 313 on display 312 of computer system 311 to a desired location.

In accordance with an alternate embodiment of the present invention, steps 210-220 may be skipped. For this embodiment, at step 225, a first computer system is placed in a channeling mode and, at step 230, information entered by a user via an input device coupled to the first computer system is channeled to a second computer system. This information may include cursor control data where the input device is, e.g., a mouse, a touch-sensitive pen-based input system, or directional buttons on a keyboard. Alternatively, this information may include alphanumeric data where the input device is, e.g., a keyboard or a microphone.

For an embodiment in which the input device is a microphone, the channeling computer system to which the microphone is coupled may first convert the speech information received from the user via the microphone into text before wirelessly transmitting the information to the second computer system. Alternatively, the information may include audio or video data. For example, the channeling computer system to which a camera is coupled may first compress the video data before wirelessly transmitting the information to the second computer system.

For one embodiment of the present invention, the display screen of the first computer system may provide no visual feedback of information entered via the input device coupled to the first computer system when the first computer system is in a channeling mode. For this embodiment, the visual feedback may be provided to the user via the display screen of the second computer system in real time. For another embodiment, the display screen of the first computer system may provide limited visual feedback of information entered via the input device when the first computer system is in a channeling mode. For this embodiment, the visual feedback provided by the display screen of the first computer system may be, for example, a translucent cursor or pointer for an embodiment in which the information being channeled is cursor control data.

As used herein, the term "real time" is measured from the perspective of the user, and may significantly vary according to the type of user-entered information that is being channeled by a first computer system to a second computer system. For example, for one embodiment of the present invention, the information entered by a user into a computer system in a channeling mode is cursor control data. For this embodiment, "real time" transmission of the

information to a second computer system is sufficiently rapid enough to provide a user with reasonable cursor control on the display screen of the second computer system. For another embodiment of the present invention, the information entered by a user into a computer system in a channeling mode is alphanumeric data (e.g. either by speaking into a microphone or typing on a keyboard). For this embodiment, "real time" transmission of the information to the second computer system may be considerably slower, with perceptible lag time, such as may be experienced by, e.g., a speech recognition application.

At step 235 of Figure 2, selected text 304 of Figure 3a is wirelessly transmitted from computer system 301 to computer system 311 and is inserted at the desired location selected using mouse 303 to drag icon 313 of Figure 3b. Next, at step 240, the first computer system is place back into a non-channeling mode. This may be done automatically after dropping the icon using the mouse, or it may be done in response to the user either pressing or releasing one or more buttons or keys of one or more input devices coupled to either computer system 301 or 311.

This invention has been described with reference to specific exemplary embodiments thereof. It will, however, be evident to persons having the benefit of this disclosure that various modifications and changes may be made to these embodiments without departing from the broader spirit and scope of the invention. The specification and drawings are, accordingly, to be regarded in an illustrative rather than a restrictive sense.

CLAIMS

What is claimed is:

1. A first computer system comprising:

an input device to receive information from a user;

a processor to interpret the information as input data intended for the first computer system if the first computer system is in a non-channeling mode, and to interpret the information as input data intended for a second computer system if the first computer system is in a channeling mode; and

a wireless transmitter to wirelessly transmit, in real time, the information to the second computer system if the first computer system is in the channeling mode.

2. The first computer system of claim 1, further comprising a display screen to provide visual feedback of the information if the first computer system is in the non-channeling mode, and to provide more limited feedback of the information if the first computer system is in the channeling mode.

3. The first computer system of claim 2, wherein the display screen is to provide no visual feedback of the information if the first computer system is in the channeling mode.

4. The first computer system of claim 1, wherein the wireless transmitter is a short-range wireless transmitter.

5. The first computer system of claim 1, wherein the wireless transmitter is to transmit the information according to a Bluetooth wireless communication protocol.

6. The first computer system of claim 1, wherein the information includes alphanumeric data.

7. The first computer system of claim 1, wherein the information includes cursor control data.

8. The first computer system of claim 1, wherein the input device is a microphone and the processor is to convert the information from speech into text before the information is transmitted to the second computer system if the first computer system is in the channeling mode.

9. A first computer system comprising:

a processor;

a first input device to allow a user to enter information to be used by the processor;

a wireless receiver; and

memory having software stored thereon to cause the processor to receive information via at least one alternate input device coupled to

a second computer system and channeled through the second computer system to the processor, via the receiver, in real time.

10. The first computer system of claim 9, wherein the wireless receiver is a short-range wireless receiver.

11. The first computer system of claim 10, wherein the wireless receiver is to receive the information according to a Bluetooth wireless communication protocol.

12. The first computer system of claim 9, further comprising a display screen, and wherein the software is to allow the information to control cursor movement of a cursor to be displayed on the display screen .

13. A computer-readable medium including a plurality of instructions readable therefrom, the instructions, when executed by a first computer system, cause the first computer system to perform operations comprising:

receiving information from a user via an input device;

interpreting the information as data intended for the first computer system if the first computer system is in a first mode;

interpreting the information as data intended for a second computer system if the first computer system is in a second mode; and

channeling the information to the second computer system if the first computer system is in the second mode.

14. The medium of claim 13, wherein the instructions further cause the first computer system to perform operations comprising converting the information in accordance with a Bluetooth wireless communication protocol.

15. The medium of claim 13, wherein the instructions further cause the first computer system to perform operations comprising providing visual feedback of the information if the first computer system is in the first mode, and providing more limited feedback of the information if the first computer system is in the second mode.

16. The medium of claim 13, wherein the information includes alphanumeric data.

17. The medium of claim 13, wherein the information includes cursor control data.

18. The medium of claim 13, wherein the instructions further cause the first computer system to place the first computer system in the second mode in response to determining that a predefined key or plurality of keys have been depressed.

19. A method comprising:

enabling a user to move a cursor of a display screen of a first computer system according to manipulation of a first cursor control device of the first computer system; and

enabling a user to move the cursor of the display screen according to manipulation of a second cursor control device of a second computer system operating in a channeling mode.

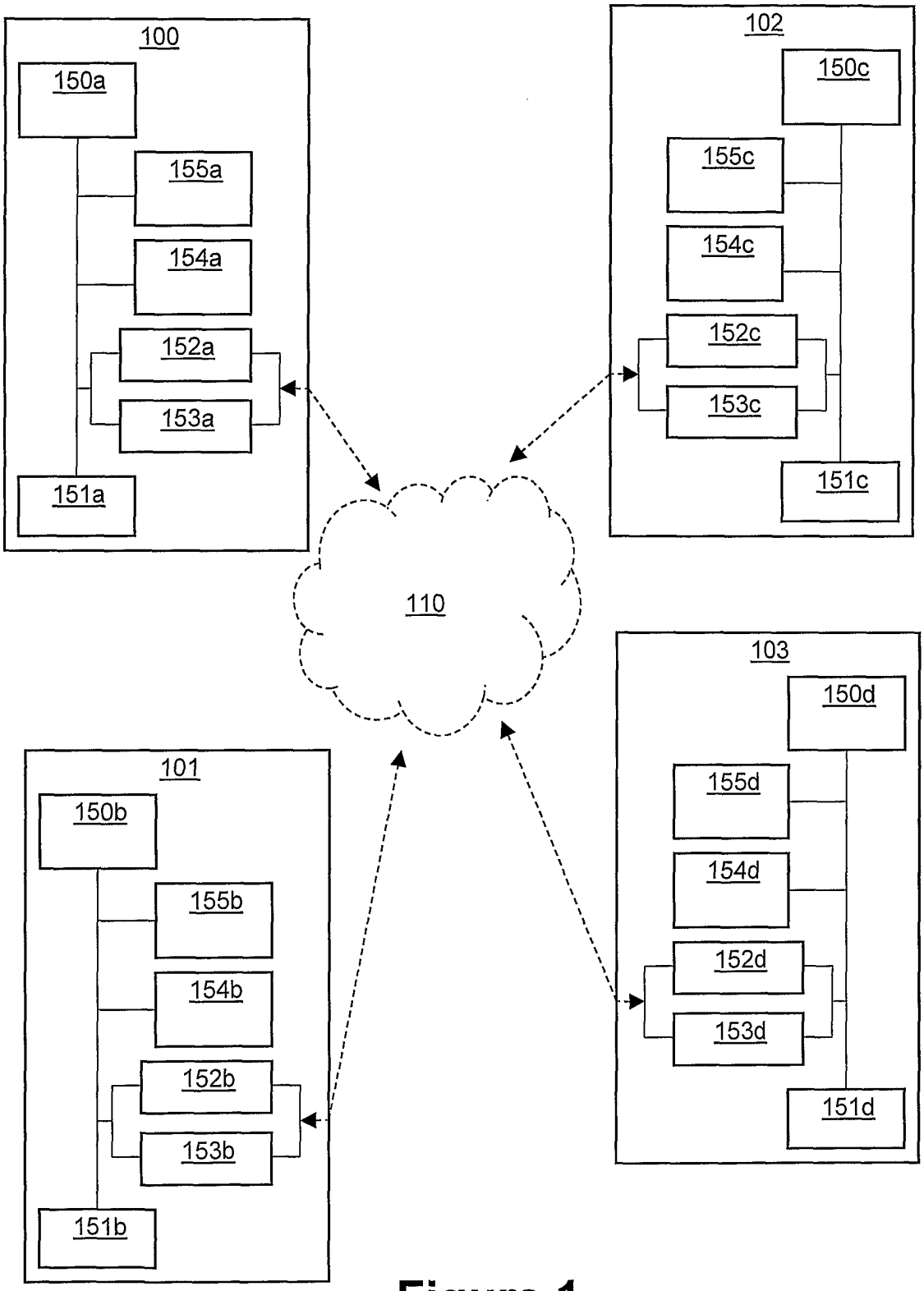
20. The method of claim 19, further comprising displaying an icon on the display screen that graphically represents text selected on the second computer system.

21. The method of claim 20, wherein enabling a user to move the cursor of the display screen according to manipulation of a second cursor control device includes enabling the user to drag and drop the icon to a desired location.

22. The method of claim 21, further comprising wirelessly receiving the text from the second computer system to the first computer system, and inserting the text at the desired location.

23. A computer system programmed to implement the method of claim 19.

24. A computer system programmed to implement the method of claim 22.


100
150a
155a
154a
152a
153a
151a
102
150c
155c
154c
152c
153c
151c
110
103
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101
150b
155b
154b
152b
153b
151b

Figure 1

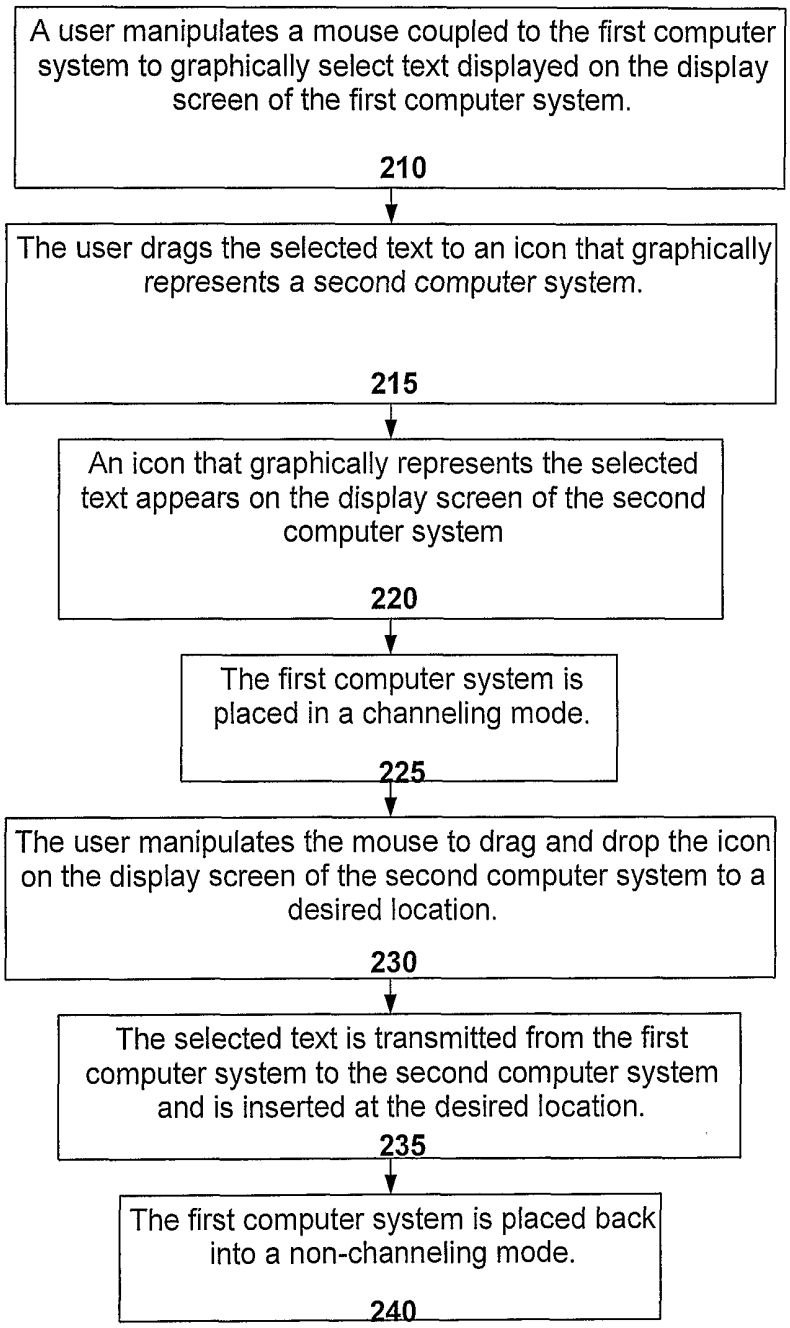
A user manipulates a mouse coupled to the first computer system to graphically select text displayed on the display screen of the first computer system.
210
The user drags the selected text to an icon that graphically represents a second computer system.
215
An icon that graphically represents the selected text appears on the display screen of the second computer system
220
The first computer system is placed in a channeling mode.
225
The user manipulates the mouse to drag and drop the icon on the display screen of the second computer system to a desired location.
230
The selected text is transmitted from the first computer system to the second computer system and is inserted at the desired location.
235
The first computer system is placed back into a non-channeling mode.
240

Figure 2

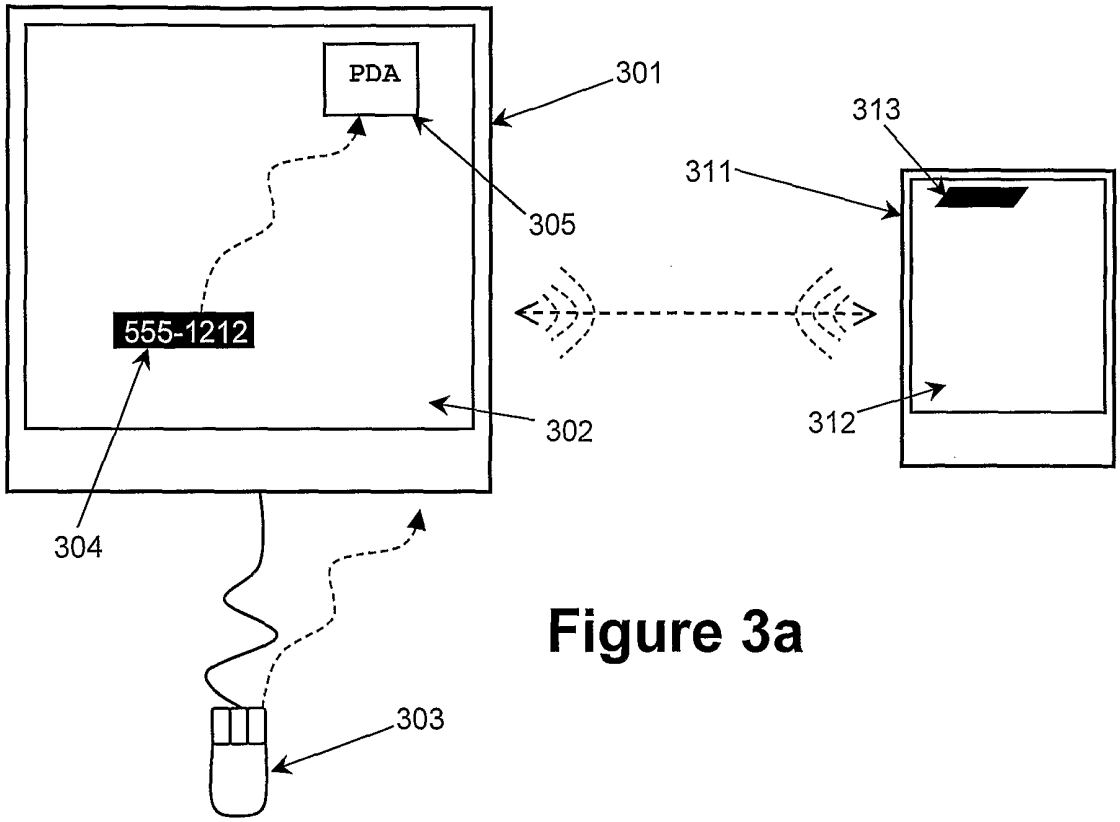

Figure 3a

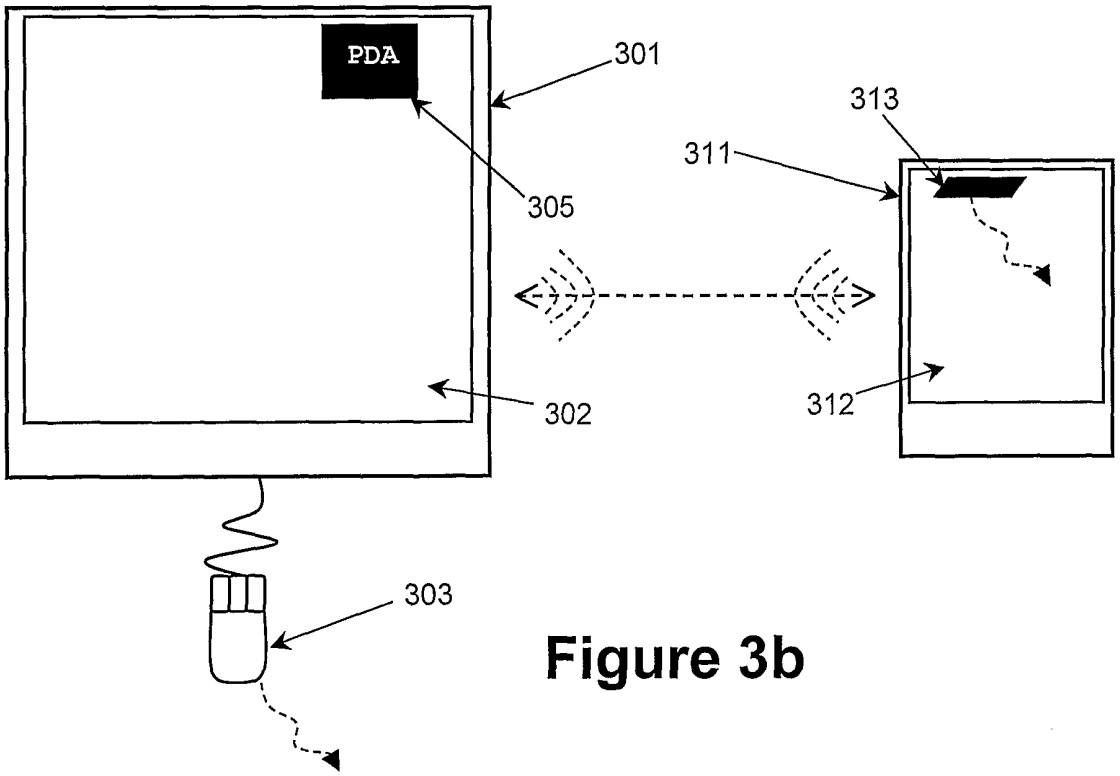

Figure 3b