

focus from one window to another window that does not currently have keyboard focus (for example by switching windows by using the mouse to click on a window that does not currently have keyboard focus), or by some other action of the user that the operating system 22 is configured to recognize as a shift in keyboard focus from one window (process) to another window (process) running on the operating system 22. Other examples of a user switching windows would be by a user selecting a window that does not have system focus by using the ALT and TAB key or ALT and ESC key, or by selecting it from the task bar in Windows XP™.

[0052] In the absence of the input management system 20, keyboard input, once translated by the applicable keyboard device driver, would be placed in an applicable message queue for receipt by the application in the window that currently has the keyboard focus. As illustrated in FIG. 1, the input management system 20 interposes itself between the translated keyboard input and the process(es) which may receive the translated keyboard input. By interposing itself in this way, the input management system 20 can be used to redirect keyboard input received in the user input stream 24 to one or more other processes that provide enhanced functionality (expander processes) in association with the process that previously had keyboard focus before redirection occurred.

Logical Focus

[0053] As discussed above, keyboard input can be directed to a particular process using the system-level input focus provided by the operating system 22. This is one approach to control the flow of the user input stream 24 for some embodiments, if the operating system 22 and the associated personal computing device operate fast enough to handle a rapid stream of input from the keyboard-type device. However, managing redirection of the user input stream 24 solely through the assignment of system-level input focus can present certain challenges. For example, from the perspective of the input management system 20, with certain Windows™ applications such as the Internet Explorer™ browser or the Excel™ spreadsheet, one cannot reliably maintain the same state of the original application when switching input focus at the operating system level back to the original application following a redirection. As well, with certain operating systems such as Windows™, certain applications, such as the MS-DOS™ command window, will not automatically give up system-level input focus.

[0054] In the first embodiment, a timer mechanism is preferably implemented to provide another layer of keyboard focus. In this way, with the introduction of the input management system 20, at least two levels of keyboard focus are supported: the keyboard focus provided at the operating system level (earlier referred to more generally as the system-level input focus), and a logical keyboard focus supported by the input management system 20. For the purposes of this specification, “logical keyboard focus” refers to an assignment of keyboard input to a process while another process continues to be assigned operating system-level keyboard focus. More generally, in this specification the term “logical input focus” refers to an assignment of input from a keyboard-type device to a process while another process continues to be assigned system-level input focus. Thus, in the first embodiment, through the use of

logical keyboard focus, the input management system 20 is configured to support the redirection of keyboard input from one process to another process even though the first process continues to be assigned keyboard focus at the operating system level. In this way, keyboard input from the keyboard 14.1 can be directed towards the appropriate process based on the context in which the keyboard input is being received even though another process has been assigned keyboard focus at the operating system level and would be therefore entitled to otherwise receive the keyboard input. Enabling the redirection of keyboard input to be independent of which process has keyboard focus at the operating system level provides a significant advantage in that it allows the input management system 20 to support redirection of the keyboard input to one or more processes independent of limitations imposed by the operating system 22 on keyboard focus at the operating system level. Moreover, this approach provides improved consistency in how input from the keyboard 14.1 (more generally, from a keyboard-type device) is received by applications in the presence of one or more processes that provide expanded functionality for one or more of the other processes resident in the operating system 22.

Operating Environment

[0055] The personal computing device 10 in the first embodiment is a laptop computer having a graphical display device comprising a liquid crystal display.

[0056] FIG. 2 shows, for illustration purposes, a block diagram of personal computing device 10 according to the first embodiment. As shown in FIG. 2, the personal computing device 10 comprises a processing unit 12 (for example, a CPU) connected via bus 11 to a computer-readable medium 16. The computer-readable medium 16 provides a memory store for computer programs and data residing in the personal computing device 10, including, in the first embodiment, the input management system 20, the operating system 22, the first process 30, represented by the word processor Microsoft™ Word™, and the second process 34, represented by the predictive text entry system 34.1. The computer-readable medium 16 can include one or more types of computer-readable media including volatile memory such as Random Access Memory (RAM), and non-volatile memory, such as a hard disk or Read Only Memory (ROM). In the first embodiment, the computer-readable medium available on the personal computing device 10 comprises RAM, ROM and a hard disk drive. Other types of user programs can also be stored in the personal computing device 10 and used in connection with the input management system 20 such as a browser or micro-browser, a spreadsheet, an email application or another user application.

[0057] The keyboard-type device 14 provides a mechanism for providing user input to programs running on the personal computing device 10. As discussed earlier, user input is received from the keyboard-type device 14 in the form of codes received in user input stream 24 and which represent input key events associated with user operation of the keyboard-type device 12. As indicated above, in the first embodiment the keyboard-type device 14 is a QWERTY-type keyboard. However, the keyboard-type device 14 can be a keyboard, a keypad or both a keyboard and a keypad, and the actual configuration of a keyboard or keypad can