

[0026] The processor **105** is coupled to a memory **115**. The memory **115** stores program code and data for use by the processor. In some embodiments more than one physical memory may be used, for example separate memories may be used for program code and data. Also, in some embodiments more than one processor may be used in which case the processor **110** is representative of multiple processors and the memory **115** is representative of a shared or distributed memory system.

[0027] In the memory **115** is a user interface (UI) control module **120**. The UI control module is a program module that runs on the processor **105**. Other programs in the memory **115** include an operating system and a set of application programs.

[0028] The processor **105** is also coupled to an area-constrained UI driver **125**. The area-constrained UI driver **125** accepts input and output commands from the processor **105** and responsively controls an area-constrained user interface peripheral set **127** that supplies a device-specific set of input and output channels to the user. For example, a specific smart phone provides a user with a specific display screen and a set of user input keys, and possibly touch screen input capability and/or a speech interface.

[0029] The processor is also coupled to a non-area constrained UI driver **130**. The non-area constrained UI driver **130** is controllably coupled to a flexible I/O surface **135**. The flexible I/O surface **135** may involve a flexible LCD and/or LPD monitor mounted on a roller and/or a flexible keyboard mounted on a roller **140**. The non-area constrained UI driver **130** is electrically coupled to the flexible I/O surface **135** using a rotatable electrical coupler **145** such as a set of brush contacts or an optical coupler. The rotatable electrical coupler **145** allows the driver **130** to send and/or receive electrical signals to and/or from the peripheral **135**. The peripheral **135** is flexible and is retractable because it is mounted on the roller **140**. In some embodiments, the roller may be omitted the flexible peripheral **135** may be retracted using an accordion-style or some other retraction technique. The roller represents a preferred embodiment of the present invention and will be developed further herein by way of example.

[0030] The flexible-retractable peripheral may involve a display surface, a keyboard, a touch screen, or a stylus-writable screen as are found on PDA devices. Flexible LCD displays are created, for example using polymeric semiconductor materials (LPD's). Other flexible technologies are under development. Input devices such as keypads and touch screen input devices can be readily embedded into flexible material. For example a coarse or fine matrix of contact points can be embedded into a layer of the flexible material so that when pressure is applied, a contact is made in a given cell of the matrix. Standard matrix scanning techniques can be used to debounce the inputs determine which key has been pushed or what display cells have been selected.

[0031] The processor is also coupled to a LAN/WAN interface module **150**. The LAN/WAN interface module represents a physical layer device for a wireless wide area network (WAN) and/or a wireless local area network (LAN). The wireless wide area network may involve, for example a 2.5G, 3G, or 4G cellular or PCS carrier with telephone and data services. The local area network may involve, for

example an IEEE 802.11 LAN or a personal area network such as a Bluetooth™ physical layer connection. The rest of the protocol layers of the WAN and/or LAN are generally implemented as computer code in the memory **115**.

[0032] In operation, the hand-held mobile unit **100** supplies a device-specific and area-constrained user interface to a mobile user. A network server provides information to the mobile unit **100** by customizing content to the device-specific and area-constrained user interface supplied by the mobile unit. For example, the server supplies content encoded using WML (wireless markup language) for interactive display on the device-specific and area-constrained user interface. Similarly, a set of local application programs and an operating system that reside at least partially in the memory **115** customize content for interactive display on the device-dependent area-constrained user interface.

[0033] In response to a user-initiated event, the local operating system, application programs, and/or the remote server detect a configuration change indication. For example the user pulls out a flexible and retractable LCD or LPD screen and a flexible and retractable keyboard that are mounted on roller devices. When the flexible peripherals are pulled into their opened positions, the UI control unit **120** detects this change of state and executes a reconfiguration command that causes the user interface to switch from the area-constrained user interface to the non-area constrained user interface. Now the operating system, application programs, and remote server programs can deliver content for interactive viewing using the non-area constrained user interface.

[0034] In some systems certain inputs from the area-constrained user interface set may be used to help control the non-area-constrained user interface. For example, a button on the hand-held mobile unit **100** may be used as a mouse-pointing device to control a cursor and user selections on the flexible LCD/LPD display surface that is in its rolled-out position. For example, a user button on the hand-held unit **100** is used as the mouse, the flexible roll-out key board is used for user typing and the roll-out LCD/LPD display surface is used for user display output.

[0035] The foregoing discussion describes hand-held mobile **100** unit includes a processor **105**, a memory **115** and an area-constrained user interface **125**, **127** that provides user input and/or output to the hand-held mobile unit. The hand-held mobile unit **100** also includes a flexible-retractable peripheral **135** such as a roller-mounted flexible display and-or a roller-mounted keyboard. Also included in the mobile unit is a coupling **130** that selectively couples signals between the flexible-retractable peripheral and the processor. The mobile unit also includes a non-area constrained user interface. The non-area constrained user interface involves software and drivers that drive the flexible-retractable peripheral **135**. The hand-held mobile unit selectively provides the area-constrained user interface and/or the non-area constrained user interface depending on an operating mode of the hand-held mobile unit. For example, when the user causes the flexible-retractable peripheral to assume its extended state, the coupling couples a software-driven non-area constrained user interface to the flexible-retractable peripheral. The mobile unit uses its indigenous operating system and application interfaces and/or may interact with a remote server such as an application server (e.g., using a