[0012] It would be desirable to have a mobile unit that could provide a compact smart phone user interface (UI) to a user, but could then be reconfigured to support a full desktop style UI so that the user could work on desktop applications while away from the home or office. For example, it would be desirable for a user of a smart phone to use the phone's area-constrained user interface while mobile, but to then be able to sit down at a table-top and convert the smart phone into a laptop-equivalent system that uses a non-area-constrained user interface.

SUMMARY OF THE INVENTION

[0013] The present invention solves these and other problems by providing systems and methods to enable a mobile unit to access an expanded set of peripherals. The present invention includes various aspects as outlined herein and in further detail in the detailed description below.

[0014] A first aspect of the present invention involves a stand-alone flexible-retractable peripheral system. The system includes a flexible-retractable peripheral surface such as an LPD display and/or a flexible keyboard. For example, the flexible-retractable peripheral surface can be extended from an enclosure using motor-driven or manually-driven roller system. The system also includes a coupling that couples signals to and/or from the peripheral to a hand-held mobile computing device. Such a stand-alone system enables the hand-held mobile unit to provide a non-area constrained user interface to a user, for example to provide laptop computer functionality or a video-viewing surface for video programming.

[0015] A second aspect of the present invention centers on a hand-held mobile unit. The hand-held mobile unit includes a processor, a memory and an area-constrained user interface that provides user input and/or output to the hand-held mobile unit. For example, the area-constrained user interface involves a driver circuit and a set of device-specific input-output hardware on the surface of the hand-held mobile unit. The hand-held mobile unit also includes a flexible-retractable peripheral such as a roller-mounted flexible display and-or a roller-mounted keyboard. Also included in the mobile unit is a coupling 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. 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 non-area constrained web browser) in order to supply the non-area constrained user interface using the flexible-retractable peripheral surface.

[0016] In a third aspect of the present invention, a method is provided for use with a stand-alone flexible-retractable peripheral system. A flexible-retractable peripheral is extended. The flexible-retractable peripheral can be, for example, a flexible display and/or a flexible keyboard. The system advertises a service via a wireless link. The advertisement is indicative of a peripheral service provided by the extended flexible-retractable peripheral. The system next engages in a service discovery protocol sequence with a mobile unit via a short-range wireless connection. Next the system couples the flexible-retractable peripheral service to the mobile unit. Finally, the system provides an input and/or output peripheral service to the mobile unit using the extended surface of the flexible-retractable peripheral.

[0017] The present invention includes a variety of other aspects. These other aspects variations of or extensions to the ones provided above. For further details, see the detailed description of the preferred embodiments.

BRIEF DESCRIPTION OF THE FIGURES

[0018] The various novel features of the present invention are illustrated in the figures listed below and described in the detailed description that follows.

[0019] **FIG. 1** is a block diagram representing an embodiment of a hand-held mobile unit that supports both an area constrained user interface and a non-area constrained user interface using flexible-retractable peripherals.

[0020] **FIG. 2** is a flow chart representing an embodiment of a method practiced by a hand-held mobile unit to support both an area constrained user interface and a non-area constrained user interface using flexible-retractable peripherals.

[0021] **FIG. 3** is a schematic drawing illustrating the front of a hand-held mobile unit that uses flexible-retractable peripherals.

[0022] **FIG. 4A** is a schematic drawing illustrating the back view of a hand-held mobile unit that uses flexible-retractable peripherals and a hinged support structure.

[0023] **FIG. 4B** is a schematic drawing illustrating the bottom view of a hand-held mobile unit that uses flexible-retractable peripherals and a downward protruding support structure.

[0024] **FIG. 5** is a schematic drawing illustrating a stand-alone flexible-retractable peripheral device with a linked rigidity support system.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0025] **FIG. 1** is a block diagram illustrating an embodiment of a hand-held mobile device **100** designed in accordance with the present invention. A processor **105** is coupled via a bus **110** to a set of system components. The bus **110** may be implemented by a standard computer bus involving a set of unbroken wires that include data, address and control lines. More generally, the bus **110** may be implemented as a collection of point-to-point of connections or any other connection topology that allows the processor to communicate with the other components in the system. In some embodiments a direct memory access controller or other point to point connections can be used to allow various components to communicate with one another without intervention by the processor **105**. The bus **110** is representative of any or all of such communication means, depending on the specific embodiment.