MOBILE UNITS WITH FEXIBLE-RETRACTABLE PERIPHERALS

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] This invention relates generally to mobile Internet and mobile computing devices. More particularly, the invention relates to flexible-retractable peripherals that allow, for example, a hand-held mobile unit such as a smart phone to be converted into a laptop-style computer.

[0003] 2. Description of the Related Art

[0004] Wireless networks have been evolving rapidly since the early 1980's when the first generation cellular telephone network was deployed. By this time the third generation network technologies are fairly well defined and initial deployments are beginning. Already, fourth generation systems are in the research phase. A key difference between the first generation systems and modem systems is the move from circuit switched analog technology to packet switched digital technology. While early cellular telephones were wireless versions of standard analog telephones, newer cellular and PCS (personal communication system) phones provide both voice and data channels. It is envisioned that in the future both the voice and data traffic will be carried by a unified packet switched network.

[0005] A key attribute of third generation (3G) cellular systems is their ability to handle data traffic. To the user, this means a cellular phone can provide Internet connectivity. A "smart phone" is a device that provides voice connectivity, data connectivity and computerized application programs such as those as offered by PDA (personal digital assistant) technology. For the purposes of this application, a smart phone is any hand-held computing device runs an operating system and application programs and can also connect to a network or other devices via an air interface (wireless connection). For example, the air interface may use a protocol such as 2.5G cellular, 3G cellular, 4G cellular, or a local wireless protocol such as IEEE 802.11, HomeRF™, or Bluetooth™.

[0006] A key problem faced by smart phones is their limited user interface capabilities. Smart phones need to be compact in design. As such, a typical smart phone has a relatively small display surface and a telephone-sized keypad. While a smart phone may be able to provide wireless Internet capabilities, its limited display surface area precludes it from providing a full featured web browser as found on desktop systems. Some prior art systems use speech recognition and voice based operating system techniques to address the user interface size constraints imposed by smart phones. Still, voice based user interfaces are cumbersome in the way they control complex data entry and menu navigation requirements that arise in operating systems and application programs such as spread sheets.

[0007] Prior art systems understand the restricted user interface capabilities of smart phones and similar mobile devices. As such, various dialects of XML (eXtensible Markup Language) have been developed to allow content to be customized for interactive display on specific types of smart phones and other mobile devices. A variation of XML known as WML (Wireless Markup Language) includes language constructs (e.g., tag sets) that allow a server to deliver customized content to a mobile device made by a specific manufacturer and having a specific model number. This allows the content to be customized for the device-specific configuration supplied by the mobile device.

[0008] In general, a device-specific user interface that involves a restricted display area and a fixed set of user interface buttons, such as those found on a smart phone or a PDA is called an "area-constrained user interface." A user interface found on a desktop system such as a PC or workstations is called a "non-area-constrained user interface." Laptop computers also have a display area large enough to fit into the non-area-constrained interface model. That is, general web browsers can display the same content on a laptop, a workstation, or a PC. This non-device-specific interface as used by web browsers for desktop and laptop systems is called a non-area-constrained user interface. Device-specific content does not need to be supplied to machines that support a non-area constrained user interface (moderate to large size monitor, keyboard and mouse). In some specific embodiments of non-area constrained user interfaces, the keyboard and mouse may be traded for a touch screen or other input means, but the display monitor must be big enough to support user viewing without the constraints of a small screen as is found on a hand-held device.

[0009] Typically, systems with non-area constrained user interfaces involve a desktop user interface. For example, a desktop user interface is found on computer systems such as those running the Windows™ or X-Windows™ operating systems. In general, any graphical user interface that allows a user to make menu selections and/or icon selections in a non-area constrained environment can be thought of as a desktop interface. Typically, desktop interfaces use pointing devices such as mouse devices and also provide optional keyboard support. Some desktop user interfaces also provide speech recognition and voice based prompts.

[0010] It should be noted that different models of smart phones and other mobile devices will have different display surface sizes and shapes, and different sets of keys on different types of keypads (area-constrained). This is in contrast to desktop systems that can all be assumed to have a desktop sized monitor, a standard keyboard, and a mouse (non-area constrained). While WML and similar technologies can be used to specify how content should be delivered to a variety of smart phone devices, the display surface area and keypad surface area limitations remain. A smart phone is generally limited in its set of peripherals and therefore is incapable of providing the type of user interface that can be supplied by computer systems with full sized display surfaces, keyboards, and other devices such as pointing devices.

[0011] Recent developments have brought about the concept of a flexible LCD display screen. For example, Phillips Research Laboratories has demonstrated a flexible display technology that uses a polymeric semiconductor material. This technology provides an active-matrix LPD (liquid polymeric display) technology that can be mounted onto flexible, bendable surfaces. A newer technology LPD technology by Visson Inc. (acquired by Philips) is able to make LPDs that can be rolled up like a newspaper. Also, because keyboard technology is relatively simple and is based on making and breaking electrical contacts, the technology exists to make a flexible roll-up keyboard.