

## ACTIVE KEYBOARD SYSTEM FOR HANDHELD ELECTRONIC DEVICES

### CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part of U.S. patent application Ser. No. 10/320,529, filed Dec. 17, 2002, which claims the benefit of U.S. Provisional Patent Application Ser. No. 60/342,382, filed Dec. 27, 2001, each of which are incorporated herein by reference.

### BACKGROUND OF THE INVENTION

#### [0002] 1. Field of the Invention

[0003] The present invention generally relates to handheld data entry devices and, more particularly to an active keyboard system for handheld electronic devices. The active keyboard system dynamically presents available choices on a display grouped to effect unambiguous selection of the available choices through use of input means, thereby providing users of handheld electronic devices with a consistent set of techniques to perform all commonly used functions including entering alphanumeric text and data into the device using only one hand.

#### [0004] 2. Description of the Related Art

[0005] Portable electronic devices are rapidly becoming smaller while their capabilities are continually increasing. Shrinking size has limited the ability of the user to physically manipulate the keyboard in order to input information into the electronic device and access information from the device. Some electronic devices have been produced with miniature keyboards, but these have proven difficult to use and the keys are too small for fast entry of data with the fingers. Using normal size keys for a complete keyboard limits how small a device can be due to the necessary width of the keyboard. Some companies have created normal size keyboards that break into overlapping pieces when the computer is not in use, but even then the device must still be relatively large.

[0006] Today many electronic devices are small enough to fit into the palm of the hand. With such small size it would be desirable to be able to quickly enter data, or to navigate the Internet with one hand, where that one hand not only supports the device but is also able to quickly enter data or commands using all five digits. A device for quickly and efficiently entering data, including full text, with a limited number of keys, such as that provided by the present invention, is needed in order to fully utilize the power of these small electronic devices.

[0007] The prior art has shown several methods of data entry using a limited number of full size keys. One such method is the "multi-tap" method. This method involves using twelve or more keys with several letters or symbols assigned to each key. The user taps each key until the desired letter appears on the device's display. This system allows the user to input complete text messages using a limited number of keys, but it is a time consuming system due to the excessive number of keystrokes and timeouts required, it has no Internet browsing capability, and it forces the user to shift the position of his fingers from key to key, further reducing keystroke efficiency.

[0008] Another method of inputting data using a limited number of keys are the systems described in U.S. Pat. No. 5,818,437, issued Oct. 6, 1998 to Dale L. Grover et al., and U.S. Pat. No. 6,011,554, issued Jan. 4, 2000 to Martin T. King et al. These systems also assign each key a plurality of values, but eliminate the need to press each key multiple times. The user simply presses each desired key once and the computer attempts to decipher what word the user intended to input out of the several possible words which could be formed from the several letters on each key. If the computer comes up with the wrong word the user can scroll through a number of other possibilities. These systems are effective in reducing the number of keystrokes as compared to the multi-tap method. They cannot, however, be used to input uncommon words and names due to a limited vocabulary, they have no application to Internet browsing, and they cannot be used without the user changing finger position on the keys.

[0009] U.S. Pat. No. 5,854,624, issued Dec. 29, 1998 to Jeffrey A. Grant, is an example of a pocket-sized interface for Internet browsing. The Grant '624 device uses a touch sensitive switch and several keys to allow a user to interface with the Internet. While the Grant '624 device does function to allow a user to navigate the Internet, it shows no way of entering data such as text and numbers, and is not designed for one hand operation.

[0010] U.S. Pat. No. 6,164,853, issued Dec. 26, 2000 to Lisa L. Foote, is also relevant in that it discloses an ergonomic housing for a handheld device. The Foote device fits over a standard electronic device such as a remote control and allows the user to comfortably operate such a device using only one hand. The Foote device does not, however disclose any method for quickly entering a variety of data, nor show any method of navigating the Internet.

[0011] Additional relevant art includes U.S. patent application Publication No. 2002/0060699 A1, published May 23, 2002 for Giovanni D'Agostinin (character input device based on a two-dimensional movement sensor); U.S. patent application Publication No. 2002/0163504 A1, published Nov. 7, 2002 for Matthew G. Pallakoff (hand held device that supports fast text typing); U.S. patent application Publication No. 2003/0036362 A1, published Feb. 20, 2003 for Joshua R. Buessler et al. (interchangeable cover for a mobile communications device); and U.S. patent application Publication No. 2003/0048262 A1, published Mar. 13, 2003 for Charles Wu et al. (method and apparatus for navigation, text input, and phone dialing).

[0012] Additional related art includes U.S. patent application Publication No. 2003/0052861 A1, published Mar. 20, 2003 for Jiang Peng (portable communication device with detachable joystick and method therefore); U.S. patent application Publication No. 2004/0012566 A1, published Jan. 22, 2004 for Gary R. Bradski (intuitive mobile device interface to virtual spaces); and U.S. patent application Publication No. 2004/0018863 A1, published Jan. 29, 2004 for G. Eric Engstrom et al. (personalization of mobile electronic devices using smart accessory covers).

[0013] Additional related art includes U.S. Pat. No. 4,891,777, issued Jan. 2, 1990 to James M. Lapeyre (single hand keyboard arrays providing alphanumeric capabilities from twelve keys); U.S. Pat. No. 5,187,480, issued Feb. 16, 1993 to Ronald H. Thomas et al. (symbol definition apparatus);