

U.S. Pat. No. 5,332,322 issued Jul. 26, 1994 to Thomas L. Gambaro (ergonomic thumb-actuable keyboard for a hand-grippable device); U.S. Pat. Nos. 5,471,042 and 5,565,671, issued Nov. 28, 1995 and Oct. 15, 1996, respectively, to David Kirkeby et al. (handheld data entry terminal having dual trigger switches); U.S. Pat. No. 5,612,719, issued Mar. 18, 1997 to Ernest H. Beernik et al. (gesture sensitive buttons for graphical user interfaces); U.S. Pat. No. 5,666,113, issued Sep. 9, 1997 to James D. Logan (system for using a touchpad input device for cursor control and keyboard emulation); and U.S. Pat. No. 5,703,623, issued Dec. 30, 1997 to Malcolm G. Hall et al. (smart orientation sensing circuit for remote control).

[0014] Additional related art includes U.S. Pat. No. 5,736,976, issued Oct. 6, 1998 to Nina T. Cheung (computer data entry apparatus with hand motion sensing and monitoring); U.S. Pat. No. 5,808,567 issued Sep. 15, 1998 to Seth R. McCloud (apparatus and method of communicating using three digits of a hand); and U.S. Pat. No. 5,931,873, issued Aug. 3, 1998 to James M. Cisar (programmable mobile device with thumb wheel).

[0015] Additional related art includes U.S. Pat. No. 6,052,070, issued Apr. 18, 2000 to Seppo Kivellä et al. (method for forming a character string, an electronic communication device and a charging unit for charging the electronic communication device); U.S. Pat. No. 6,067,358, issued May 23, 2000 to Alan H. Grant (ergonomic cellular phone); U.S. Pat. No. 6,104,317, issued Aug. 15, 2000 to Jerry Panagrossi (data entry device and method); U.S. Pat. No. 6,201,554, issued Mar. 13, 2001 to Robert M. Lands (device control apparatus for hand-held data processing); and U.S. Pat. No. 6,243,080, issued Jun. 5, 2001 to Anders L. Molne (touch-sensitive panel with selector).

[0016] Additional related art includes U.S. Pat. No. 6,347,290, issued Feb. 12, 2002 to Joel F. Bartlett (apparatus and method for detecting and executing positional and gesture commands corresponding to movement of handheld computing device); U.S. Pat. No. 6,392,640, issued May 21, 2002 to Craig A. Will (entry of words with thumbwheel by disambiguation); U.S. Pat. No. 6,400,376, issued Jun. 4, 2002 to Mona Singh et al. (display control for hand-held data processing device); U.S. Pat. No. 6,437,709, issued Aug. 20, 2002 to Qi Hao (keyboard and thereof input method); U.S. Pat. No. 6,466,198, issued Oct. 15, 2002 to David Y. Feinstein (view navigation and magnification of a hand-held device with a display); and U.S. Pat. No. 6,567,101, issued May 20, 2003 to Keith C. Thomas (system and method utilizing motion input for manipulating a display of data).

[0017] Additional related art includes U.S. Pat. No. 6,573,883 issued Jun. 3, 2003 to Joel F. Bartlett (method and apparatus for controlling a computing device with gestures); U.S. Pat. No. 6,603,420, issued Aug. 5, 2003 to Jin Lu (remote control device with motion based control for receiver volume, channel selection, or other parameters); U.S. Pat. No. 6,611,255, issued Aug. 26, 2003 to Jason T. Griffin et al. (hand-held electronic device with a keyboard optimized for use with the thumbs); U.S. Pat. No. 6,641,482, issued Nov. 4, 2003 to Iwao Masuyama et al. (portable game apparatus with acceleration sensor and information storage medium storing a game program); U.S. Pat. No. 6,683,599, issued Jan. 27, 2004 to Robert A. Shepherd (keypads style

input device for electrical device); and U.S. Pat. No. 6,690,358, issued Feb. 10, 2004 to Alan E. Kaplan (display control for hand-held device).

[0018] Additional related art includes European Patent Application Publication No. EP 0 735 514 A1, published in October 1996, Great Britain Patent Application Publication No. GB 2 193 023 A, published in January 1988, World International Patent Organization (WIPO) Patent Application Publication No. WO 02/073995 A1, published in September 2002, European Patent Application Publication No. EP 1 271 288 A2, published in January 2003, and WIPO Patent Application Publication No. WO 03/015379, published in February 2003.

[0019] None of the above inventions and patents, taken either singly or in combination, is seen to describe the instant invention as claimed. cl SUMMARY OF THE INVENTION

[0020] The present invention is 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 system using only one hand. The active keyboard system includes a processor, a memory, and a display communicatively connected to one another. The system includes input means for inputting data into the system that include at least one selector and a plurality of keys. Active keyboard system software is stored on the memory and is configured to dynamically present available choices on the display grouped to effect unambiguous selection of the available choices through use of the input means.

[0021] The active keyboard system software includes presentation code and filter code. The presentation code includes step or scroll resolution code to enable scrolling, and grid presentation code to organize available choices on a visual grid and provide the visual grid to the display. The presentation code displays a selection pointer controlled by one of the selectors at a time. The grid presentation code configures the visual grid with one or more panes each configured as a matrix with a plurality of columns and plurality of rows. The pane(s) may be configured as a matrix with three columns and four rows, a matrix with one column and a plurality of rows, etc. The pane(s) may be clear, transparent, translucent, and/or opaque.

[0022] The visual grid includes a plurality of cells and the grid presentation code may have grid population code to populate each of the cells with an alphanumeric character, a symbol, a music note, an icon, text, an ideogram, or a logogram. The presentation code may have application adapter code to translate transactions between application and presentation code, sound code to provide an audio announcement for a selected choice, an audio confirmation for completion of an action or an alarm for failure to complete an action, and feedback code to enhance user interaction with the system.

[0023] The filter code is configured to separate an intentional user motion input from accidental motion. Filter code may have external forces filter code to separate user input