internal representation of keyboards may use any coordinate system, including but not limited to Polar and Cartesian coordinate systems.

[0074] When the on-screen keyboard **130** is represented internally using a Polar system, key positions are set by bounding angles and radial distance from the center. In the preferred embodiment, multiple concentric circles are permitted. The system can accept direct Polar inputs. Alternatively, it can map Cartesian inputs into Polar coordinates before performing calculations.

[0075] When the on-screen keyboard **130** is represented internally using a Cartesian system, key positions are set by left, right, top, and bottom of a bounding box. The horizontal and vertical positions are relative to one corner, usually top left but can vary by platform and operating system (OS). In the preferred embodiment, multiple rows of keys are permitted.

[0076] The directional input system **100** may also alternate between several keyboards for a variety of reasons. Such reasons may include the following: uppercase vs. lowercase letters, alphabets for other supported languages, extended alphabets for languages with large numbers of letters, diacritics, numbers vs. letters, symbols and punctuation, strokes vs. character components, different alphabets for the same language, function keys, and precision mode for selecting specific exact spell characters.

[0077] In another preferred embodiment of the invention, the directional input system **100** also provides a mechanism for changing the keyboard face and the input directions. The system includes an input means to switch among a set of system modes. A mode is a combination of keyboard, key-map, and sometimes dictionary. Modes can be used for many things, including but not limited to entering characters, executing functions, and changing system parameters.

[0078] In the preferred embodiment, the system may also contain the following buttons: Space or Select word, Backspace, Next & Previous word, Next & Previous character, Shift/Caps Lock, and Menu/Mode switch. Each of these buttons is mapped to a system function. The functions that can be performed by buttons include, but are not limited to the following:

[0079] Select: Adding a specified word to the message area and at the same time clearing out the current word;

[0080] Next/Previous word: Altering which word is highlighted for selection;

[0081] Next/Previous character Altering the last character entered;

[0082] Backspace/Delete word: Deleting a character or word;

[0083] Shift, Caps lock Altering the case of letters being entered;

[0084] Undo: Undoing last function or entry;

[0085] Cut/Copy/Paste: Standard clipboard commands;

[0086] Escape: Activate/deactivate the directional text input;

[0087] Toggling Next Lock/Hold;

[0088] Extend or Add Suffix. Selecting a word and displaying its possible suffixes or using any additional characters entered to extend the selected root word;

[0089] Change to a new Language;

[0090] Change to a new Keyboard layout;

[0091] Download/install new language/keyboard layout/program version; and

[0092] Toggle Precision mode for Exact Spell.

[0093] Some characters that can optionally be entered by buttons include, but are not limited to:

[0094] "Smart Punctuation", which intuitively determines which punctuation is most appropriate based on the word context;

[0095] "Smart Diacritics", which intuitively determines which diacritic to be added; and

[0096] "Smart Tones", which intuitively determines which tone to be added to a word for tonal languages, such as Vietnamese. Alternately, a tone key could display a selection of tones to add to the current word or last character entered.

[0097] The directional input system **100** supports multiple languages. Each language supported is stored in a separate language database (LDB). The language database stores words organized by word length and frequency of use within the given language. When the system uses case sensitive letters, the database storage is also case sensitive and thus words are stored in a mixed case format.

[0098] The directional input system **100** can optionally support user added words. These words are either stored in a separate user database (UDB) or appended to the primary language database (LDB). When a UDB is used, it organizes words by word length and recency of use.

[0099] The directional input system **100** can optionally support dynamic word prediction, where likelihood changes are made either by re-ordering sections of the LDB, or via a recency database (RDB) which is organized by word length and recency of use.

[0100] The final word choice list is retrieved and ordered using the following types of data: word length, ordinal ranking, letter weight, and recently used words. Only words that have at least as many letters as the letters entered are presented. When "Word Completion" is used, longer words may be presented if they are determined to be likely. Words in the LDB may be ordered by frequency, most common first, and least common last.

[0101] The invention adopts an algorithm which matches the entry sequence to letters of words in the LDB based on their nearness to the point/angle of each entry. For example, the weighting may approximate an inverse square of the distance from the center of the corresponding letter. Grouping letters for efficiency is an optional, yet preferred feature; it excludes letter matching when the letter is far outside of the smaller area of adjacent letters surrounding the point/angle of entry. A detailed description of the algorithm is set further in the copending application, U.S. Ser. No. 09/580,