

ments. In FIG. 2A, device 200 includes a click wheel 210 and a separate display 212. FIG. 2B illustrates a portable communications device having a virtual click wheel input device in accordance with some embodiments. In FIG. 2B, device 200 includes a virtual click wheel 210 displayed on a touch screen display 212. The click wheel constitutes an interface for receiving user commands (such as selection of one of more items and/or icons that are displayed on the display 212) and/or navigation commands (which may, for example, control scrolling through the items and/or icons that are displayed on the display 212). The user may use the click wheel 210 by touching it (making a point of contact) and then moving the point of contact while maintaining contact. Such angular displacement may indicate a navigation command to scroll through the items and/or icons that are displayed on the display 212. By pressing down on the click wheel 210, or on a click wheel button 208 (e.g., at the center of the click wheel), the user may select one or more items and/or icons that are displayed on the display 212. Thus, a pressing down gesture may indicate a user command corresponding to selection. Alternatively, breaking contact with a click wheel image on a touch screen surface may indicate a user command corresponding to selection.

[0055] The device 200 may display a menu or hierarchy of the applications that may be executed or run on the device 200. For example, the displayed menu or hierarchy for the applications may include 'Favorites' for popular applications for this user, 'Recent' for calls that have been made, answered, and/or missed within a first pre-determined time period (such as the last day, week or month), or alternately the N most recent calls (regardless of how long ago they occurred, where N is a predefined positive integer, for example an integer between 10 and 100), 'Contacts' (which corresponds to the address book 144 in FIG. 1), 'Dial' (which corresponds to the telephone module 138 in FIG. 1) and 'SMS' (for sending and receiving short text messages). The menu or hierarchy may also include 'Music', 'Extras', 'Settings' and 'Now playing' icons (not shown in the Figures) that correspond to a music player module. The display 212 may also convey other information, such as an icon that indicates a remaining stored power level for the device 200.

[0056] Attention is now directed toward FIG. 3, a flow diagram illustrating a process of selecting and providing candidate character sequences in response to text input in accordance with some embodiments. As text is entered by a user on a device, candidate character sequences corresponding to complete or partial words may be provided in response to the entered text. The user may select a candidate character sequence, some of which are partial words, to extend further or to complete the entered text. As used in the specification and the claims, a "partial word" is a character sequence of two or more characters that is less than a complete word and which may be presented to a user for selection, thereby increasing the speed of the text entry process. Presenting partial words as suggestions for further extending an input sequence helps speed up the text entry process as compared to entering one character at a time or presenting only complete word suggestions. Entering or selecting one letter at a time can be slow, particularly with interfaces, such as the click wheel 210, that are not designed specifically for text entry. On the other hand, presenting only complete words as suggestions to complete an input sequence can be inefficient as well because the complete word suggestions may not include the

choice desired by the user, forcing the user back to the other extreme of entering one letter at a time.

[0057] An input sequence of one or more characters is received from an input device (302). A user inputs a sequence of characters into the portable device via an input device, such as the click wheel 210 and the click wheel button 208. As used herein, the input character sequence is a sequence of non-whitespace characters, delimited by whitespaces or punctuation, input by the user via the input device. The sequence of characters may constitute a word, number, abbreviation, name, trade name, mnemonic, technical term or other delimited sequence of characters, or at least an attempt to enter a such a sequence.

[0058] A character sequence tree is identified (304) with a first node. The first node corresponds to the input sequence. The character sequence tree, which includes portions of the usage frequency tree, is identified from the usage frequency tree 146. The character sequence tree includes the node corresponding to the input sequence (hereinafter the "input sequence node") and its ancestors; in other words, the root node corresponding to the empty string, the input sequence node, and a path from the root node to the input sequence node. The character sequence tree also includes the subtree descending from the input sequence node. The subtree includes nodes corresponding to character sequences that are complete or partial words, for all of which the input sequence is a proper prefix. The children nodes of the input sequence node correspond to character sequences that are concatenations of the input sequence and one additional character. For example, if the input sequence node corresponds to the input sequence "the," then the children nodes of the input sequence node correspond to the character sequences "thea," "theb," "thee," and so forth, up to and including "they," as well as a child node corresponding to the completed word "the", which may be represented by appending a space character, as the sequence "the " (in this example, there are no entries in the usage frequency tree 146 for words starting with "thez", nor are there entries in the usage frequency tree such as "the-" or "the" that involve a non-letter character continuation).

[0059] All children of the input sequence node whose weights do not satisfy one or more predefined usage frequency criteria are "removed" from further consideration (306). In some embodiments, the children node are removed from consideration by removing them from a copy of the subtree corresponding to the input sequence node. Alternately, the children of the input sequence node whose weights do not satisfy one or more predefined usage frequency criteria are marked as "removed" without actually removing the nodes from the tree or the subtree replica. In yet another embodiment, the identified children are removed from a list of children nodes, without modifying the tree. In some embodiments, the usage frequency criterion is that the weight of the child node w divided by the weight of the input sequence node w_i is greater than a predefined threshold m . In other words, $w/w_i > m$ or $w > mw_i$. In some embodiments, w/w_i is an estimate of the probability that the child node is the desired continuation, and the threshold for this probability is, for example, $m=0.05$. In some other embodiments, the predefined criterion is that the weight of the child node w is one of the largest N weights of child nodes of the input sequence node, and the value of N is, for example, $N=5$. Subtrees of children nodes that do not meet this criterion are removed from the character sequence tree as well.