

frequency for that word in a language, or by a predefined group or people, or by the user of the device **100**, or a combination thereof. As described below, a dictionary may include multiple usage frequency rankings for regional variations of the same language and/or be tailored to a user's own usage frequency, e.g., derived from the user's prior emails, text messages, and other previous input from the user. The word recommendation module identifies word recommendations for presentation to the user in response to text input by the user.

**[0038]** Each of the above identified modules and applications corresponds to a set of instructions for performing one or more functions described above. These modules (i.e., sets of instructions) need not be implemented as separate software programs, procedures or modules. The various modules and sub-modules may be rearranged and/or combined. Memory **102** may include additional modules and/or sub-modules, or fewer modules and/or sub-modules. Memory **102**, therefore, may include a subset or a superset of the above identified modules and/or sub-modules. Various functions of the device **100** may be implemented in hardware and/or in software, including in one or more signal processing and/or application specific integrated circuits.

**[0039]** Attention is now directed to FIG. 2, a flow diagram illustrating a process of providing word recommendations in accordance with some embodiments. Process flow **200** describes a process of providing word recommendations in response to input of a character string by a user.

**[0040]** A sequence of input characters is received from an input device (**202**). A user inputs a sequence of characters into the portable communications device via an input device, such as a keyboard, and the device receives the input. 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.

**[0041]** In some embodiments, the input device is a virtual keyboard (also called a soft keyboard) displayed on a touch-sensitive display of the portable device, where the user hits the keys of the keyboard ("types on the keyboard") by touching the touch-sensitive display on locations corresponding to keys of the virtual keyboard. In some other embodiments, the input device is a physical keyboard on the device (also called a hard keyboard).

**[0042]** The keyboard, whether virtual or physical, has a plurality of keys, each key corresponding to one or more characters, such as letters, numbers, punctuation, or symbols. The keys are arranged in accordance with a predefined layout that defines the positions of the keys on the keyboard. On the layout, each key has at least one neighbor key. In some embodiments, the keyboard layout follows the well-known QWERTY layout or a variant thereof. In some other embodiments, the keyboard layout may follow other layouts. Furthermore, in some embodiments, the layout may change depending on the language used on the device. For example, if English is selected as the user interface language, then the active keyboard layout may be the QWERTY layout, and other layouts may be active when another language, such as Swedish or French, is selected as the user interface language. Further details regarding keyboard layouts are described below in relation to FIG. 5.

**[0043]** Permutations of input characters and neighbor characters are determined and a set of strings are generated from the permutations (**204**). As used herein, a "permutation" is a

sequence of characters, wherein each character in the sequence is either the input character in the corresponding position in the input character sequence or a neighbor character of that input character on the keyboard layout. The first character in the permutation is the first character of the input character sequence or a neighbor of that first character on the keyboard layout, the second character in the permutation is the second character of the input character sequence or a neighbor of that second character on the keyboard layout, and so forth, up to and perhaps including the last character in the input character sequence. Thus, the length of a permutation and of a generated string is at most the length of the input character sequence.

**[0044]** For example, if the input sequence is "rheater," then the first character in any of the permutations generated for this input sequence is "r" (the first character in the input sequence) or any characters that are neighbors to "r" on the keyboard layout. The second character in a permutation is "h" or any neighbor thereof. The third character in a permutation is "e" (the third character in the input sequence) or neighbors thereof, and so forth.

**[0045]** In some embodiments, permutations may be determined for a predefined-length subset of the input sequence and strings of the same predefined length may be generated from the permutations. In some embodiments, the predefined length is 3 characters. That is, the permutations are determined and prefix strings are generated from the first three characters in the input sequence and neighbors thereof. If the length of the input sequence is less than the predefined length, a process other than process flow **200** may be used to provide word recommendations. For example, if the input sequence is one or two characters long, the input sequence in its entirety may be compared against words in a dictionary and best matches are identified.

**[0046]** The set of strings are compared against a dictionary. Words in the dictionary that have any of the set of strings as a prefix are identified (**206**). As used herein, "prefix" means that the string is a prefix of a word in the dictionary or is itself a word in the dictionary. A dictionary, as used herein, refers to a list of words. The dictionary may be pre-made and stored in the memory. The dictionary may also include usage frequency rankings for each word in the dictionary. A usage frequency ranking for a word indicates (or more generally, corresponds to) the statistical usage frequency for that word in a language. In some embodiments, the dictionary may include different usage frequency rankings for different variants of a language. For example, a dictionary of words in the English language may have different usage frequency rankings with respect to American English and British English.

**[0047]** In some embodiments, the dictionary may be customizable. That is, additional words may be added to the dictionary by the user. Furthermore, in some embodiments, different applications may have different dictionaries with different words and usage frequency rankings. For example, an email application and an SMS application may have different dictionaries, with different words and perhaps different usage frequency rankings within the same language.

**[0048]** The identified words are the candidate words that may be presented to the user as recommended replacements for the input sequence. The candidate words are scored (**208**). Each candidate word is scored based on a character-to-character comparison with the input sequence and optionally other factors. Further details regarding the scoring of candidate words are described below, in relation to FIGS. 3 and