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(54) **KEYBOARDLESS TEXT ENTRY**

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(57) **ABSTRACT**

Keyboardless text entry methods and systems are described. Various display tools are used in conjunction with, for example, pointing, scrolling and/or clicking actions to enter text into an interface. Once display tool is a pie widget shape, another display tool uses a box like shape containing other box like shapes which are scaled according to a propationate chance of containing the desirable selection.

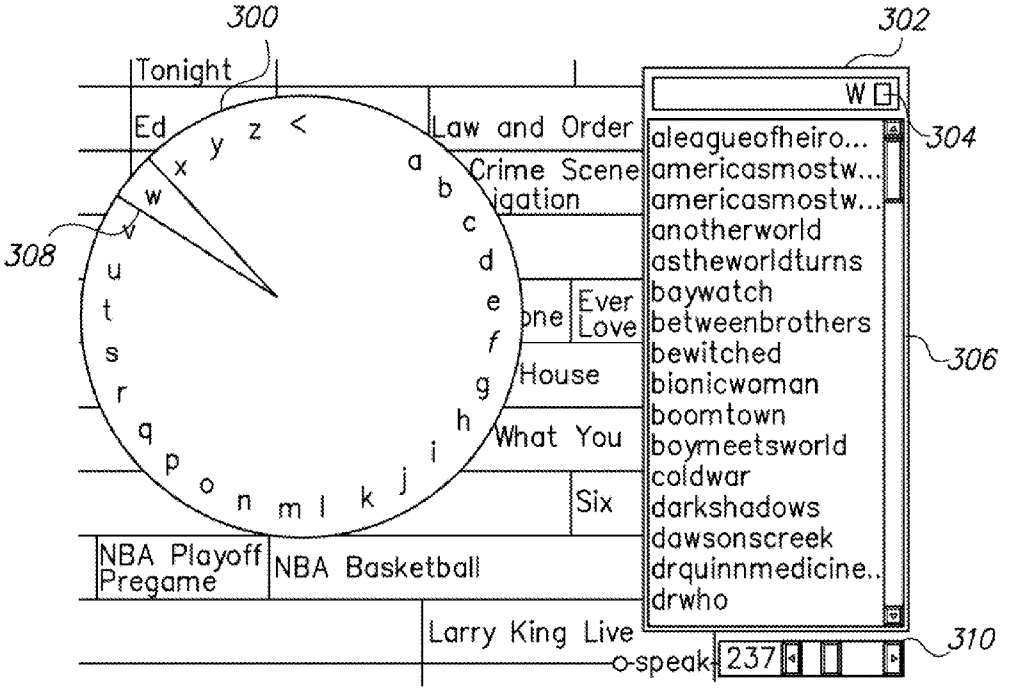


FIG. 1

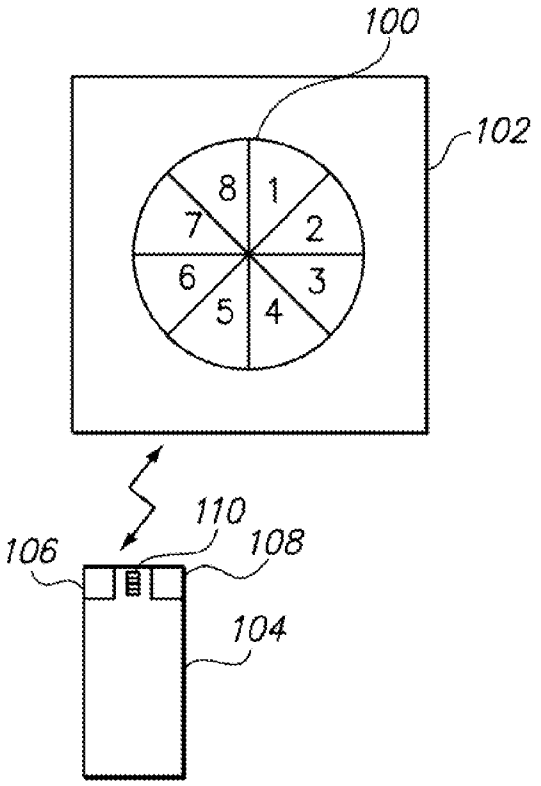

100
102
8
1
7
2
6
3
5
4
110
106
108
104

FIG. 2

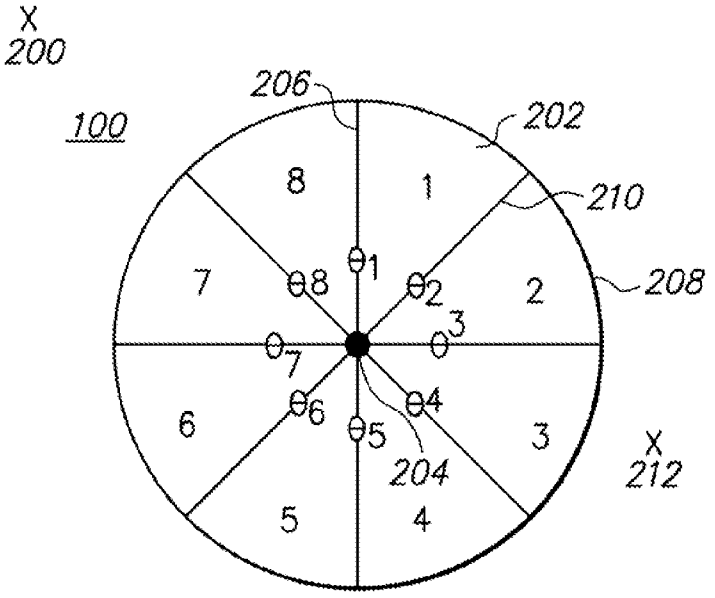

X
200
100
206
202
210
208
8
1
7
2
6
3
5
4
θ1
θ2
θ3
θ4
θ5
θ6
θ7
θ8
204
X
212

FIG. 3

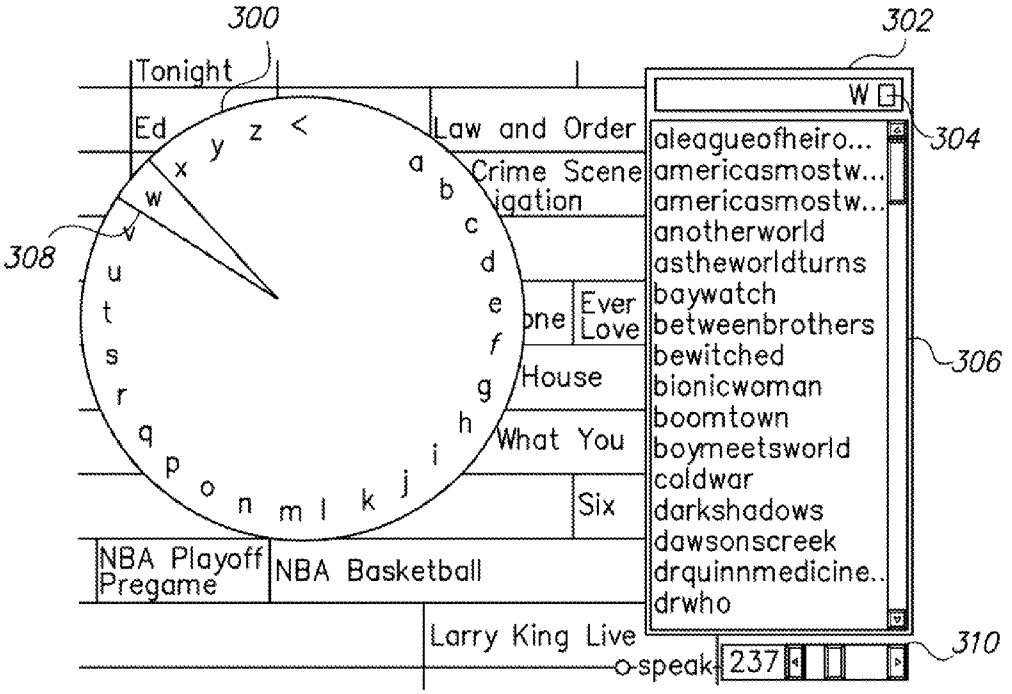

300
302
Tonight
Ed
Law and Order
Crime Scene
igation
Ever Love
House
What You
Six
NBA Playoff Pregame
NBA Basketball
Larry King Live
speak
237
W
304
306
308
310
aleagueofheiro...
americasmostw...
americasmostw...
anotherworld
astheworldturns
baywatch
betweenbrothers
bewitched
bionicwoman
boomtown
boymeetsworld
coldwar
darkshadows
dawsonscreek
drquinnmedicine..
drwho

FIG. 4

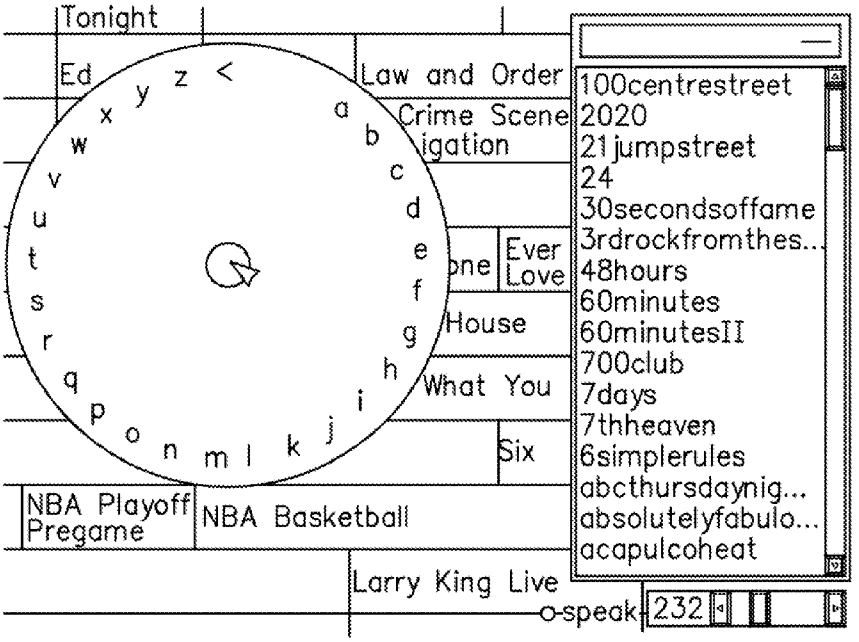

Tonight
Ed
Law and Order
Crime Scene
igation
Ever Love
House
What You
Six
NBA Playoff Pregame
NBA Basketball
Larry King Live
speak
232
100centrestreet
2020
21jumpstreet
24
30secondsoffame
3rdrockfromthes...
48hours
60minutes
60minutesII
700club
7days
7thheaven
6simplerules
abcthursdaynig...
absolutelyfabulo...
acapulcoheat

FIG. 5

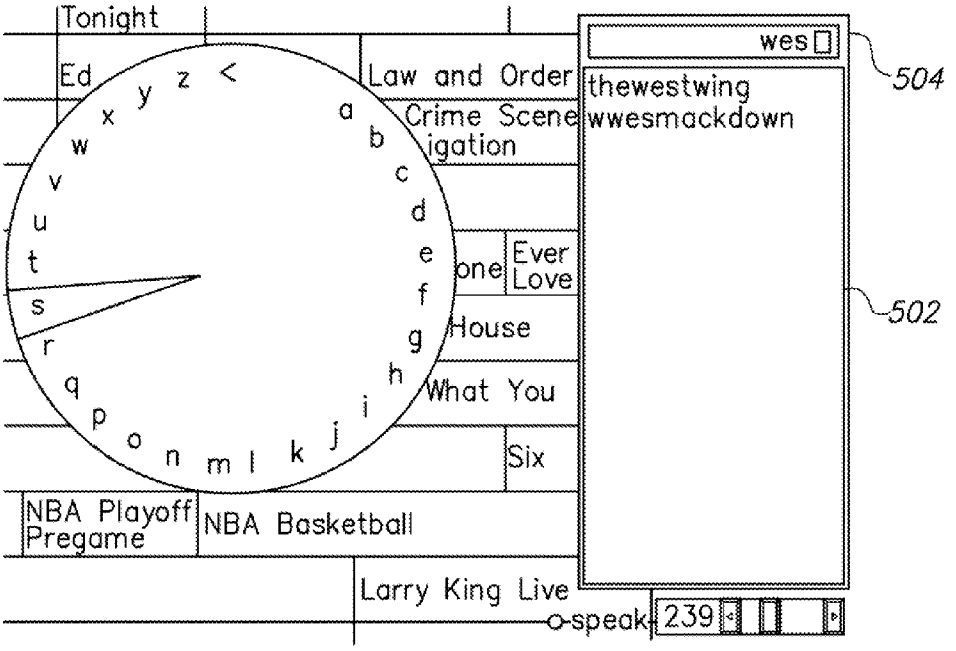

Tonight
Ed
Law and Order
Crime Scene
igation
one
Ever
Love
House
What You
Six
NBA Playoff
Pregame
NBA Basketball
Larry King Live
speak
239
wes
thewestwing
wwesmackdown
504
502

FIG. 6

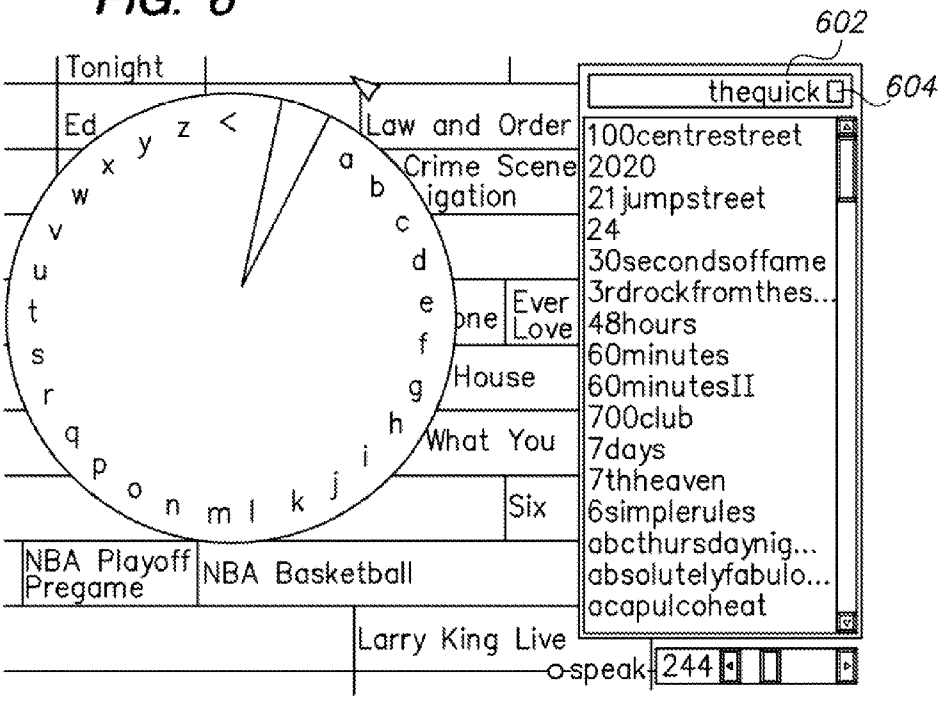

602
604
Tonight
Ed
Law and Order
Crime Scene
igation
one
Ever
Love
House
What You
Six
NBA Playoff
Pregame
NBA Basketball
Larry King Live
speak
244
thequick
100centrestreet
2020
21jumpstreet
24
30secondsoffame
3rdrockfromthes...
48hours
60minutes
60minutesII
700club
7days
7thheaven
6simplerules
abcthursdaynig...
absolutelyfabulo...
acapulcoheat

FIG. 7

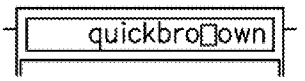


FIG. 8

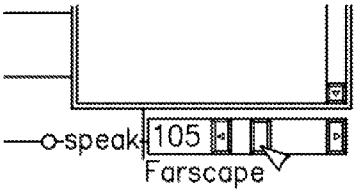


FIG. 9

FIG. 10

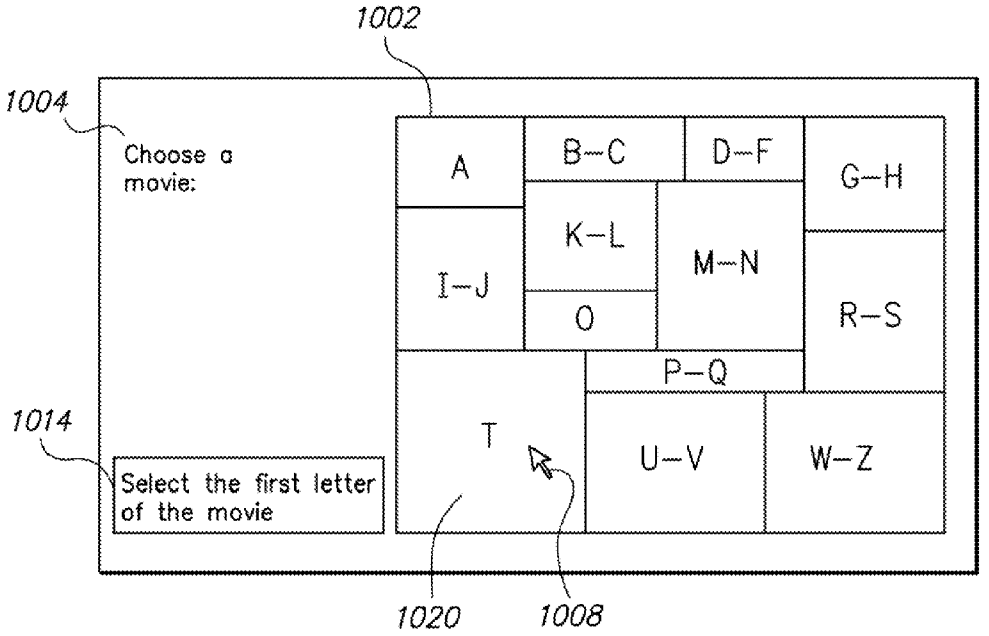


FIG. 11

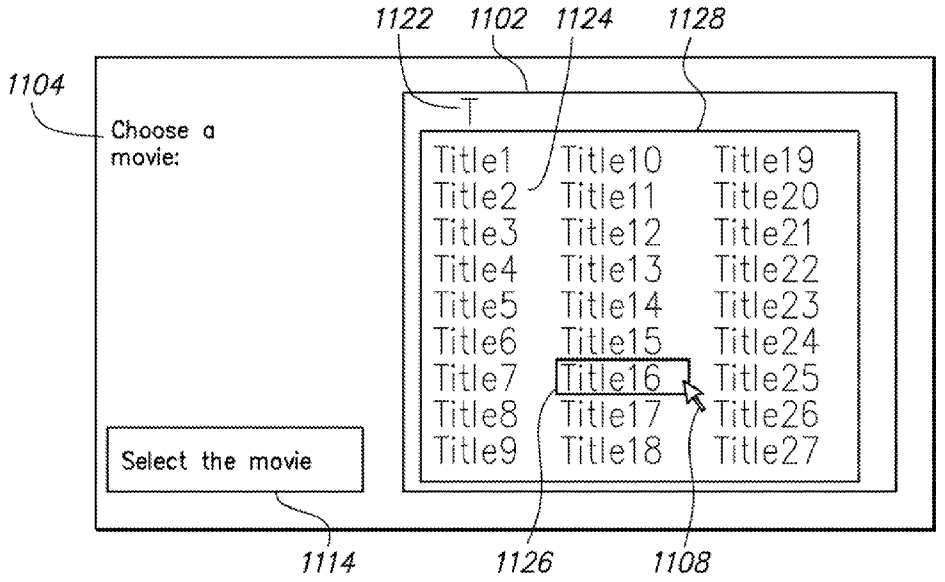


FIG. 12a

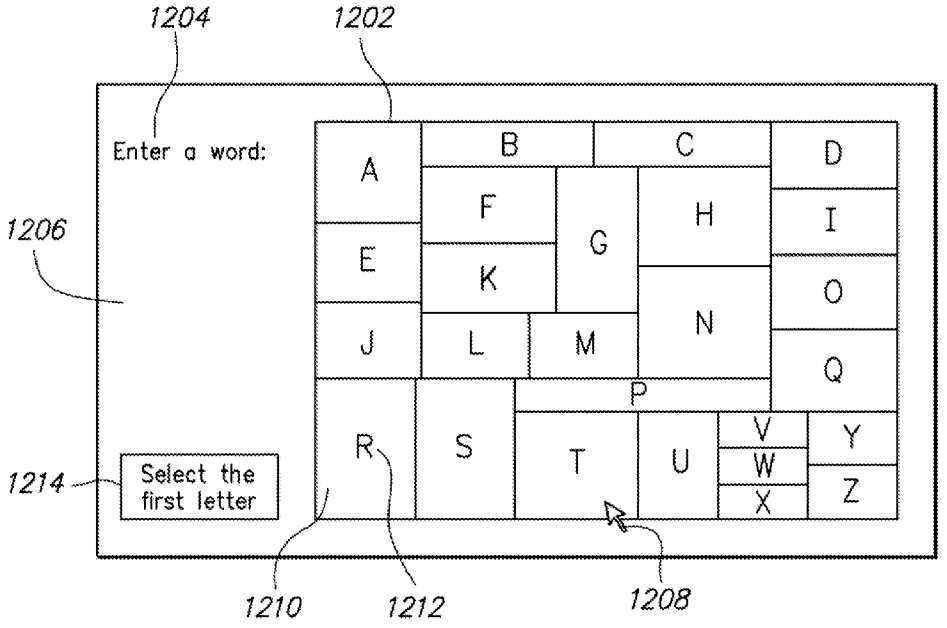


FIG. 12b

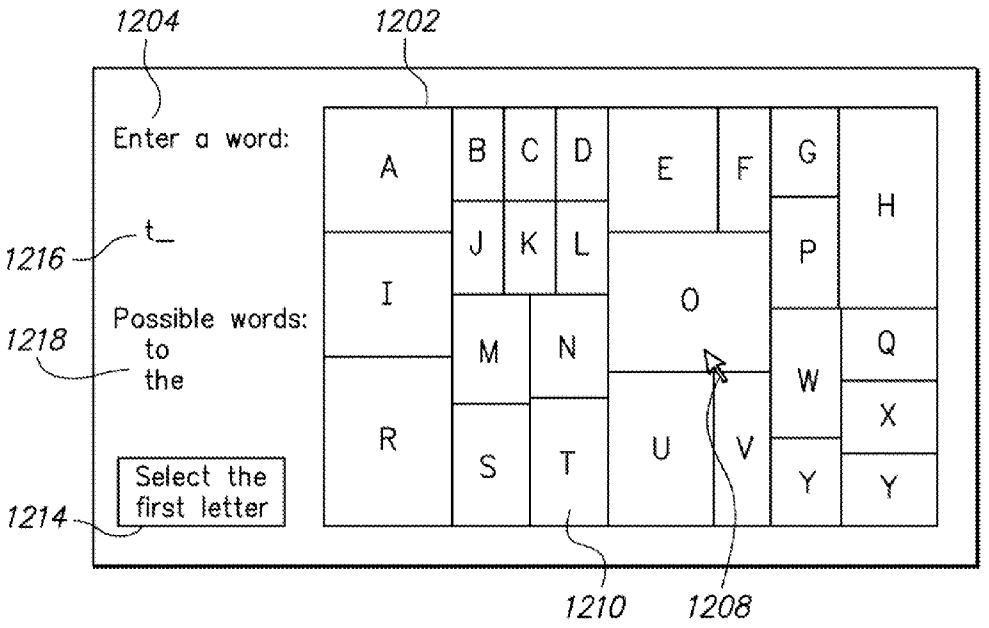
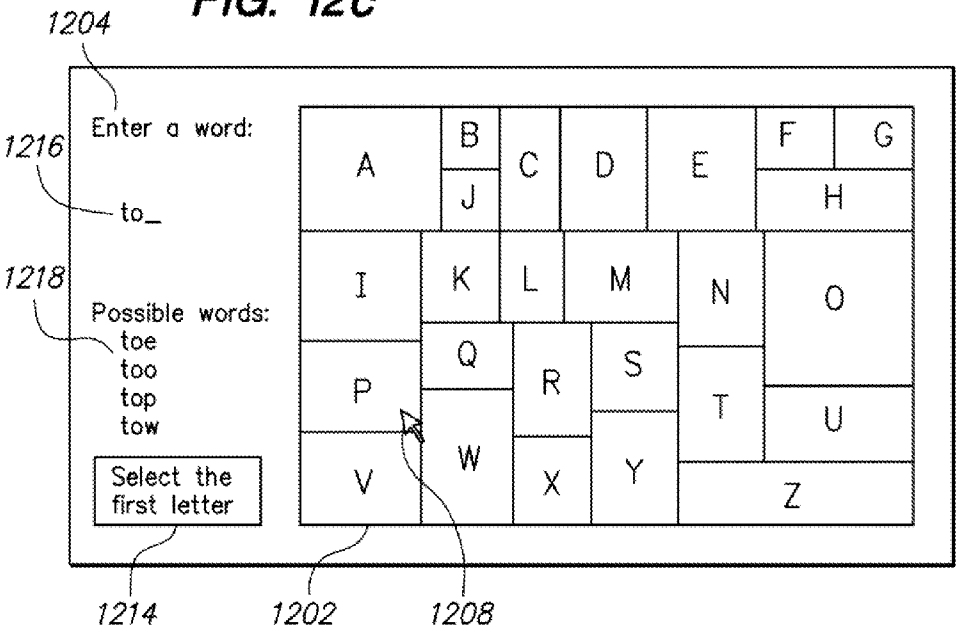


FIG. 12c



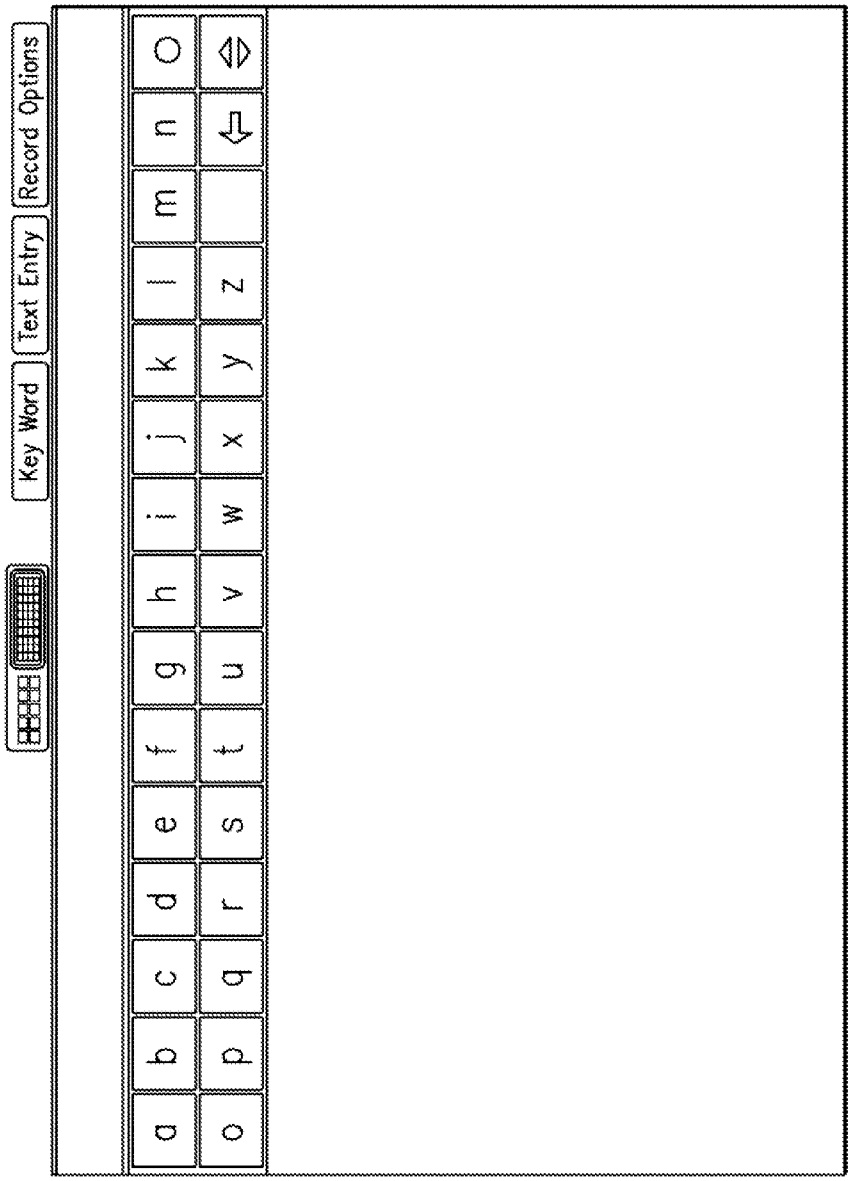

Key Word
Text Entry
Record Options
a b c d e f g h i j k l m n o
o p q r s t u v w x y z

FIG. 13

FIG. 14

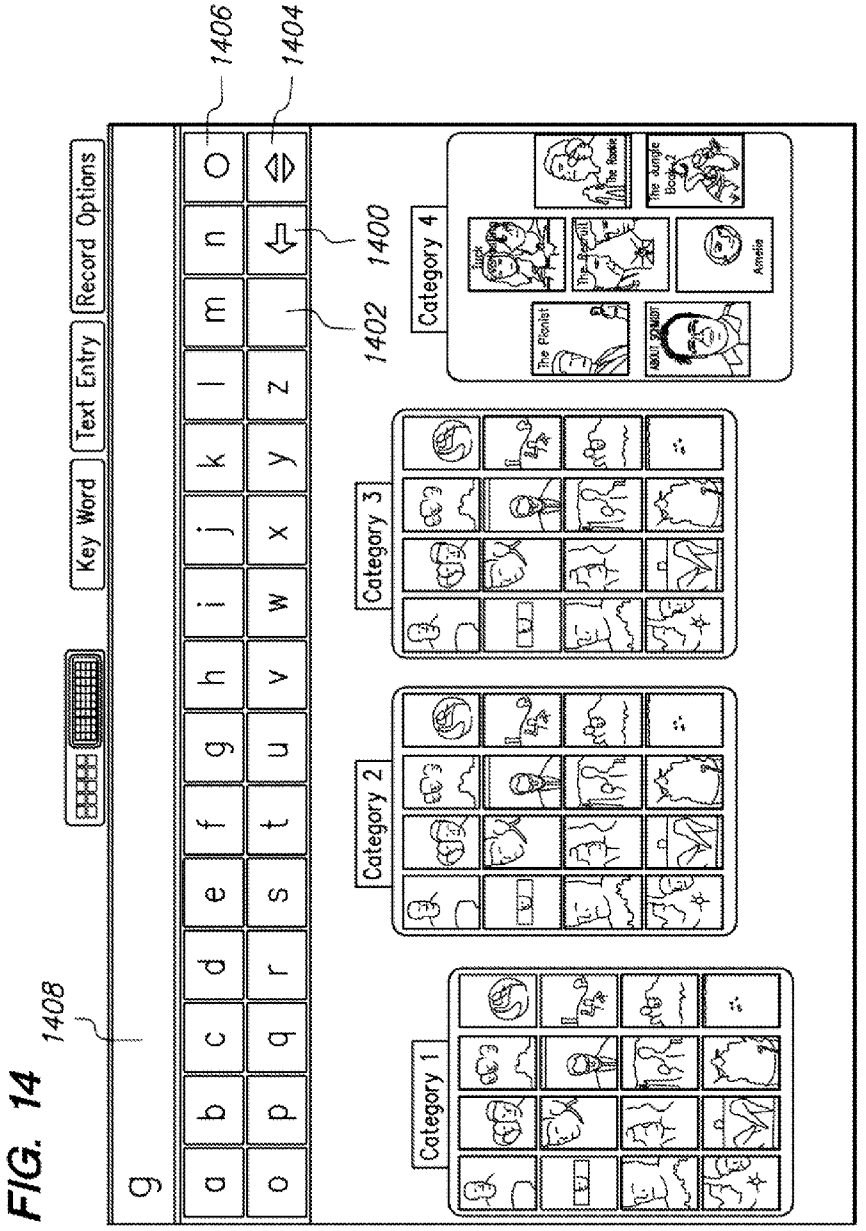

1408
1406
1404
1400
1402
Key Word
Text Entry
Record Options
g
a b c d e f g h i j k l m n O
o p q r s t u v w x y z
Category 1
Category 2
Category 3
Category 4
The Pianist
Amelia

FIG. 15

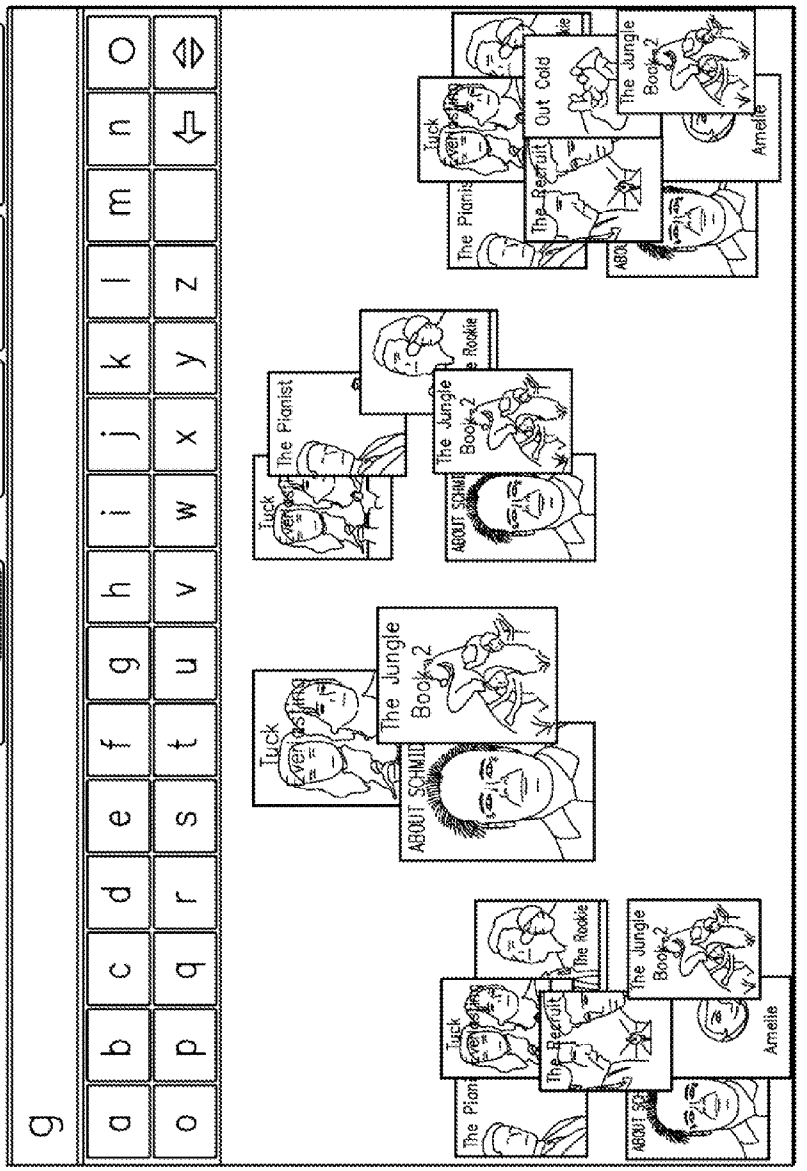

Key Word
Text Entry
Record Options
g
a b c d e f g h i j k l m n o
o p q r s t u v w x y z
Tuck Everlasting
The Jungle Book 2
The Pianist
The Rookie
The Recruit
Out Cold
Amelie

FIG. 16

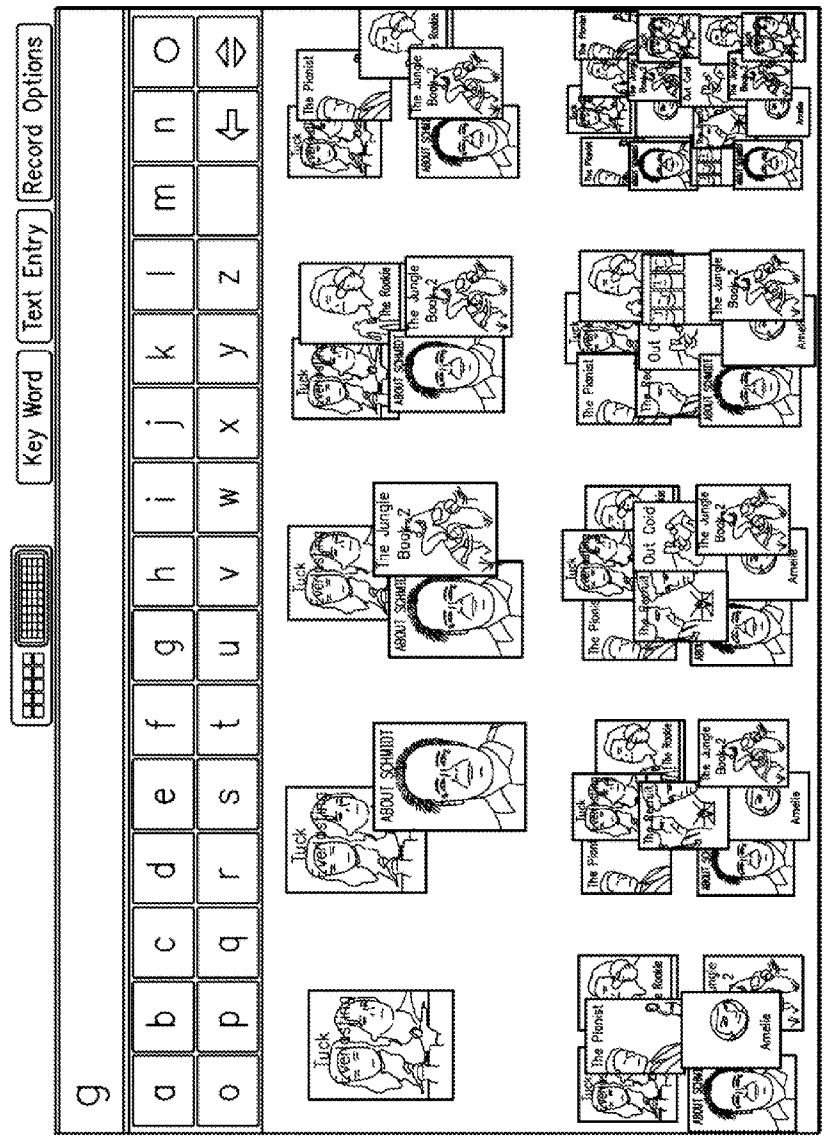

Key Word
Text Entry
Record Options
g
a b c d e f g h i j k l m n o
o p q r s t u v w x y z

FIG. 17

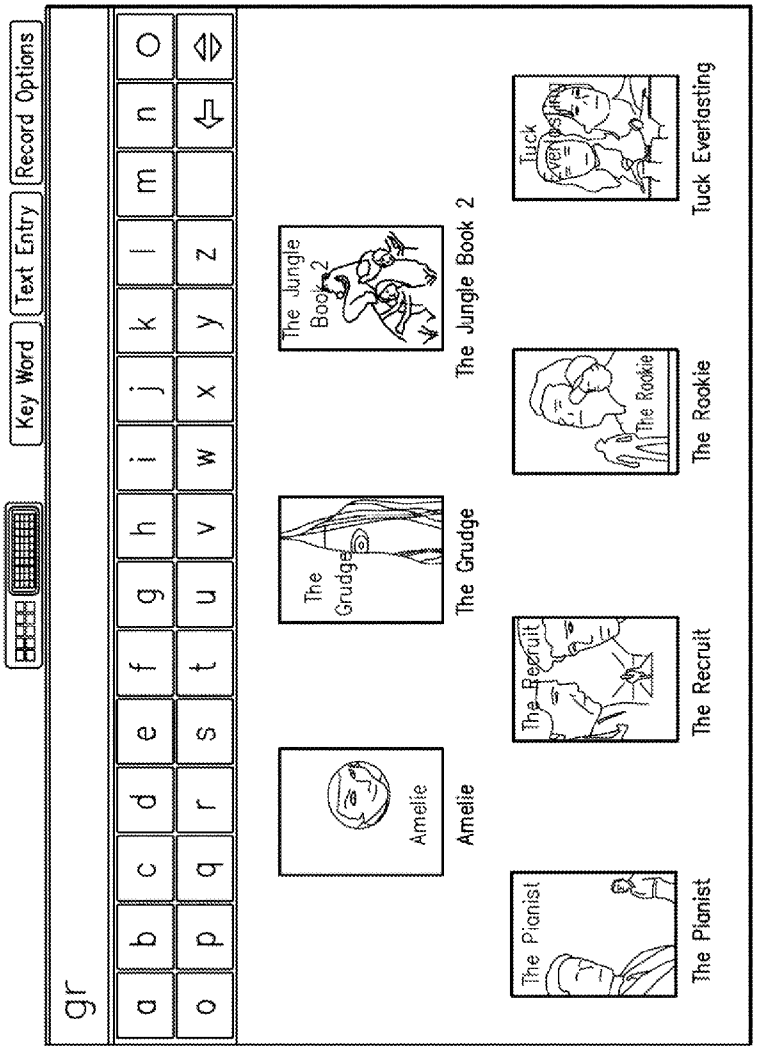
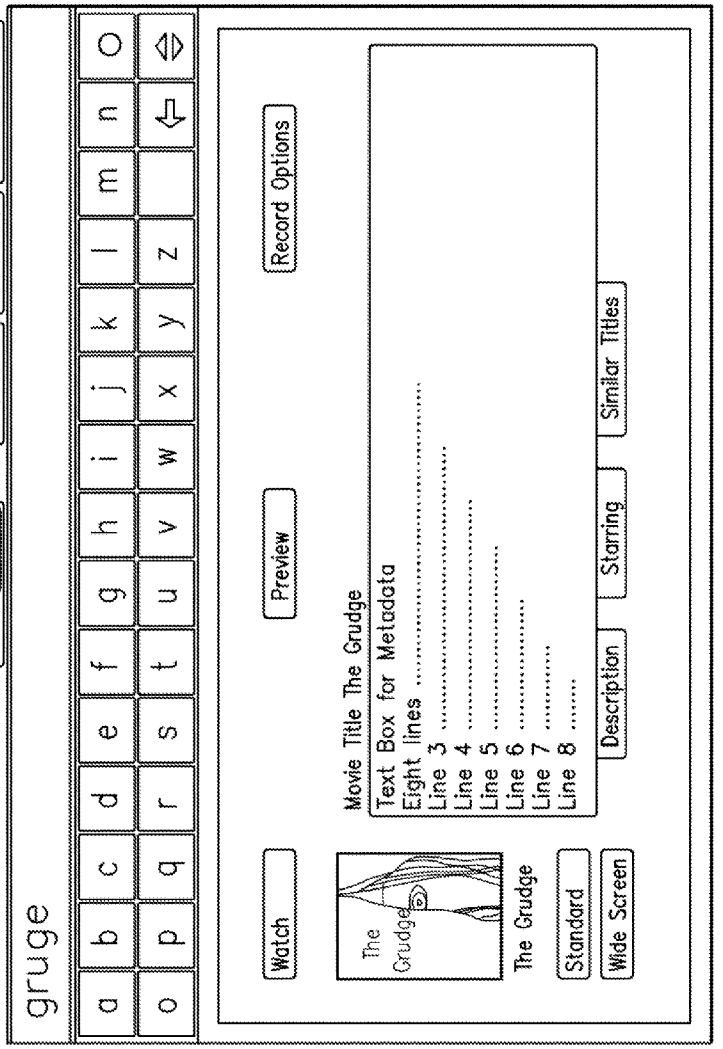

gr
Key Word
Text Entry
Record Options
a b c d e f g h i j k l m n o
o p q r s t u v w x y z
Amelie
The Grudge
The Jungle Book 2
The Pianist
The Recruit
The Rookie
Tuck Everlasting

FIG. 18


Key Word
Text Entry
Record Options
gruge
a b c d e f g h i j k l m n o
o p q r s t u v w x y z
Watch
Preview
Record Options
The Grudge
Movie Title The Grudge
Text Box for Metadata
Eight lines .....
Line 3 .....
Line 4 .....
Line 5 .....
Line 6 .....
Line 7 .....
Line 8 .....
The Grudge
Standard
Wide Screen
Description
Starring
Similar Titles

KEYBOARDLESS TEXT ENTRY

RELATED APPLICATIONS

[0001] This application is a divisional application of Ser. No. 11/063,630 filed on Feb. 23, 2005 and is related to, and claims priority from, U.S. Provisional Patent Application Ser. No. 60/546,750, filed on Feb. 23, 2004, entitled "A Zoomable Interface for Keyboard-less Text Selection and Entry", the disclosure of which is incorporated here by reference. This application is also related to, and claims priority from, U.S. Provisional Patent Application Ser. No. 60/546,847, filed on Feb. 23, 2004, entitled "Pie-Widget Keyboard-less Text Entry", the disclosure of which is incorporated here by reference.

BACKGROUND

[0002] The present invention describes systems and methods for keyboardless text entry on a display for a wide variety of consumer electronic devices such as TVs, PCs, touch screens and interactive kiosks.

[0003] Technologies associated with the communication of information have evolved rapidly over the last several decades. Television, cellular telephony, the Internet and optical communication techniques (to name just a few things) combine to inundate consumers with available information and entertainment options. As the amount of information available increases, the need to access and use this data has grown. Not only the overall amount of information available to the consumer has grown, but the variety of devices that are interactive, such as, PCs, TVs, and PDAs, have also grown. To easily enter alphanumeric data, keyboards are typically used on PCs a legacy of the typewriter. However, as more and different types of interactive devices become available to consumers, a keyboard is not always the best method of interaction. For example, keyboards suffer the drawbacks of being relatively large, costly, and requiring more skill to use efficiently than many remote control devices. To solve this problem, methods of keyboardless text entry have been created.

[0004] One example of keyboardless text entry is a touch screen where an image of a standard (i.e. QWERTY) keyboard is displayed on the screen. This solution benefits from providing a familiar layout for users and removing a physical keyboard, but suffers from other drawbacks. For example, the user's hands may obscure displayed outputs as he or she enters text by touching keys displayed on the virtual keyboard.

[0005] Another example of keyboardless text entry is a system where keystrokes are drawn with a stylus on a touch pad. These drawn keystrokes are then translated into alphanumeric characters and displayed. Some drawbacks associated with this method are the need to enter multiple keystrokes for some of the characters, and the need to learn the strokes that match each character. Yet another method of keyboardless text entry is entering text using a voice recognition device (as described, for example, in U.S. Pat. No. 6,629,077). In this method a voice input is matched to a voice command template and if a valid input is received, a corresponding character is input to a consumer electronic device. Drawbacks associated with this method include a lack of robustness in a noisy environment and the potential for extensive training of detection software.

[0006] Accordingly, it would be desirable to provide keyboardless text entry systems and methods which minimize or avoid the drawbacks associated with the keyboardless text entry systems described above.

SUMMARY

[0007] Systems and methods according to the present invention address this need and others by providing techniques for keyboardless text entry. According to one exemplary embodiment, a method for entering characters into an interface includes the steps of displaying a text entry tool having a center and a plurality of sectors relative to the center, each of the sectors associated with at least one character, selecting one of the characters by selecting an associated sector; and entering the selected one of the characters into the interface in response to a predetermined event occurring subsequent to the selection step.

[0008] According to another exemplary embodiment of the present invention, an interface input method includes the steps of selecting one of a plurality of objects provided on a display, the selected object being associated with at least one character from a first group of characters, zooming into the selected object, revealing a plurality of additional objects, each associated with one character from a second group of characters, the second group of characters including those characters which are potentially selectable given said at least one character from the first group and selecting one of the plurality of additional objects to enter a text into an interface.

[0009] According to yet another exemplary embodiment of the present invention, an interface input method includes the steps of displaying two rows of keys proximate an edge of a display screen, each key being associated with one character, selecting one of the keys, displaying the one character associated with the selected key in a text box on the display screen; and displaying candidate items for selections in a display area beside the two rows of keys, wherein the candidate items for selection are chosen based on text displayed in the text box.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The accompanying drawings illustrate exemplary embodiments of the present invention, wherein:

[0011] FIG. **1** illustrates a communication loop between a display showing a keyboardless text entry tool and a pointing and/or scrolling device according to an exemplary embodiment of the present invention;

[0012] FIG. **2** depicts an exemplary keyboardless text entry tool and an associated angular reference system according to an exemplary embodiment of the present invention;

[0013] FIG. **3** illustrates a keyboardless text entry tool, a text box, and scrollable word list overlaying a channel guide according to an exemplary embodiment of the present invention;

[0014] FIG. **4** shows another view of the keyboardless text entry tool of FIG. **3**;

[0015] FIG. **5** shows a scrollable word list based on a partially entered word associated with the keyboardless text entry tool of FIGS. **3-4**;

[0016] FIG. **6** illustrates the ability to separate words with a blank character according to an exemplary embodiment of the present invention;

[0017] FIG. **7** shows text box cursor movement for the exemplary embodiment of FIGS. **3-6**;

[0018] FIG. **8** depicts an adjustable timer usable in conjunction with the keyboardless text entry tool of FIGS. **3-7**;

[0019] FIG. **9** shows a speak toggle button usable in conjunction with the exemplary embodiments of the present invention shown in FIGS. **3-7**;

[0020] FIG. **10** depicts a zoomable keyboardless text entry interface according to an exemplary embodiment of the present invention;

[0021] FIG. **11** shows an updated zoomable display based on a user entry to the zoomable keyboardless text entry interface of FIG. **10**;

[0022] FIG. **12**(*a*) shows entering a selection to a zoomable keyboardless text entry interface with a pointing device according to an exemplary embodiment of the present invention;

[0023] FIG. **12**(*b*) shows a resulting display based on a user's selection of a character in the zoomable keyboardless text entry interface of FIG. **12**(*a*);

[0024] FIG. **12**(*c*) shows a resulting display based on a user's selection of the characters "to" in the zoomable keyboardless text entry interface of FIGS. **12**(*a*) and **12**(*b*);

[0025] FIG. **13** displays a keyboardless text entry system based on two rows of characters according to another exemplary embodiment of the present invention;

[0026] FIG. **14** illustrates an exemplary way in which text entry results and/or potential selections can be displayed using the keyboardless text entry tool of FIG. **13**;

[0027] FIG. **15** is used to describe a method of selection display based on a user entry according to an exemplary embodiment of the present invention;

[0028] FIG. **16** displays another method of selection or result display associated with a user's keyboardless text entry according to an exemplary embodiment of the present invention;

[0029] FIG. **17** displays selection refinement based on a user entry according to an exemplary embodiment of the present invention; and

[0030] FIG. **18** displays additional selection refinement based on user entries.

DETAILED DESCRIPTION

[0031] The following detailed description of the invention refers to the accompanying drawings. The same reference numbers in different drawings identify the same or similar elements. Also, the following detailed description does not limit the invention. Instead, the scope of the invention is defined by the appended claims.

First Exemplary Embodiment

Pie Widget Text Entry Interface

[0032] The present invention provides methods and systems for easily and efficiently entering text using a pointing and/or scrolling device in combination with a visual display. According to a first exemplary embodiment of the present invention a "pie widget" is displayed on a television, computer monitor or any other output screen and can be used for, among other things, text entry without the need for a keyboard. A conceptual illustration of this keyboardless text entry tool is shown in FIG. **1**. Therein, a pie widget **100** is displayed on a screen **102** and can be used to enter characters via remote control device **104**. In this example, the remote control device has two buttons **106**, **108** and a scroll wheel **110** and communicates wirelessly (or via wireline) with the system running the application which employs the pie widget **100** as a keyboardless entry tool. Those skilled in the art will appreciate that exemplary embodiments of the present invention can be used with any system, application or remote control device and that those mentioned herein are purely exemplary. Specific examples of such systems, applications and remote control devices may be found in U.S. patent application Ser. No. 10/768,432, filed on Jan. 30, 2004, entitled "Control Framework with a Zoomable Graphical User Interface for Organizing, Selecting and Launching Media Items", the disclosure of which is incorporated here by reference.

[0033] The exemplary pie widget **100** has a plurality of unique wedges or sectors **202**, as also shown in the magnified view of FIG. **2**. According to this exemplary embodiment of the present invention, each sector **202** is associated with a single character which can be selected by a user. In the example of FIG. **2**, there are eight sectors, each of which is uniquely associated with the individual numerals "1-8" which are displayed therein on the display. The area within each sector **202** can be defined, for example, using central angles relative to a center point **204** of the pie widget **200** and a reference line **206**. In this example, the reference line **206** is selected as the line which is oriented vertically relative to the display, however those skilled in the art will appreciate that other reference lines could be used. Using this framework, each sector **202** can be defined as an area between two lines each of which radiate from the center point **204** along two different central angles, optionally bounded at the edge of the pie widget **200** by a perimeter line **208**. For example, the sector **202** associated with the numeral "1" can be defined as the area between the lines **206** and **210** which radiate from center point **204** along angles θ**1** and θ**2**, respectively. Since there are eight sectors **202** in the example of FIG. **2**, and since each sector has the same size, angle θ**1**=0 degrees and angle θ**2**=45 degrees in this purely illustrative example.

[0034] For a character to be chosen using the pie widget **200**, a user selects a sector **202** associated with a character. According to exemplary embodiments described herein each sector **202** is associated with only a single character such that a user enters each character by selecting a single sector. However those skilled in the art will appreciate that the present invention is equally applicable to embodiments wherein more than one character or a range of characters are associated with each sector. Various techniques can be used to perform character selection using the pie widget **200**. According to one exemplary embodiment, once a cursor **212** is stationary for a predetermined amount of time, the character associated with the sector in which the cursor is located or associated with is selected. For example, an invisible line can be drawn between the cursor **212** and the center point of the pie **204**. The angle associated with this line is then compared with the angles associated with the predetermined sectors (e.g., θ**1**-θ**8** in the example of FIG. **2**) and the corresponding character is entered. In the example shown in FIG. **2**, an invisible line drawn from cursor **212** to the center of the pie crosses is disposed in the sector corresponding to the number "3" so the number "3" would be the character entered by the pie widget **200**.

[0035] Note that the perimeter **208** of the pie widget **200** need not limit the selection area for the cursor **212**. Alternatively, any cursor position on the display may fall within a predefined sector and could be used for character selection

and entry (possible exceptions to this include invalid areas such as the text box and the word list box described below and show in FIG. **3**). This latter feature may provide additional ease of pointing and selection, because the farther away from the center of the circle, the larger the selection area and the easier it is for a user to accurately point to the intended character space. The above examples illustrate one exemplary technique to set up a reference system for a pie widget keyboardless text entry tool according to this exemplary embodiment of the present invention, however those skilled in the art will appreciate that other reference systems could be used to implement this embodiment invention.

[0036] The pie widget can, according to one exemplary embodiment, be implemented as a circular pie menu with the characters arranged around the pie widget **300** as shown in FIG. **3**. In this example the letters "A" to "Z", a "blank space", and the "<" symbol can be used for text entry, spacing between characters, and deletion, respectively. A text box **302** can be located in the upper right above the scrollable word list box **306**, and contains a text box cursor **304**. Entering the "<" key would delete the character to the left of the text box cursor **304**. Characters can be selected by pointing to one of the sectors, e.g., by moving a cursor or rotating a scroll wheel. The pointed to slice can be identified prior to selection, e.g., by highlighting or changing the color of the sector over which the cursor is currently positioned. While the sector remains identified in this way the character will not be selected. The user can thus move the cursor across multiple sectors without selecting a character. A timer is restarted each time the user moves to a different sector. When the timer expires the character is inserted, e.g., as shown in FIG. **3** by the "w" in the text box to the left of the text cursor and the visual indication associated with that sector **308** is changed, e.g., the green coloring is changed to red. This sequence is repeated for as many characters as desired. In an exemplary embodiment of the present invention, the words in the scrollable word list **306** could represent possible selections with another program, such as a channel guide as shown in FIG. **3**, which could allow the user to move the channel guide to the program which is finally selected in the scrollable word, list for example. Although use of a timer means that text entry according to this exemplary embodiment of the present invention does not require button pressing, the remote control device **104**'s buttons can be used as alternative indications that a final text entry selection has been made.

[0037] The timer **310** can be adjusted manually with the horizontal slider located below the scrollable word list box **306**. Alternatively or additionally the timer value can be automatically adjusted based on user behavior over time and be displayed numerically as in FIG. **8**, for example. For example if the user is frequently deleting and re-entering characters, the pie widget **200** can automatically increase the timer period to allow the user more time between initial selection of a character and the pie widget **200** considering the initial selection to be a final selection that is then provided as a text entry. Conversely, if the user rarely changes any entered character, and/or if her or she frequently uses a manual selection technique, e.g., pressing a button on remote control device **104** after initial selection of a character, to expedite final selection, then the pie widget **200** can automatically decrease the timer period. FIG. **4** shows another technique for character deletion in the pie widget **200** by pointing to the center circle which can reset text entry and delete any characters chosen up to that point.

[0038] According to exemplary embodiments of the present invention, as each character is selected it can be inserted to the left of the text box cursor. As shown in FIG. **5**, the last letter selected is an "s". As each letter is selected the resultant partial word is used to search a list of words stored by the system, e.g., a dictionary of potential selections. Any word that contains the selected characters will appear in the scrollable word list box **502** below the text box **504**. Any word that appears in the scrollable word list box **502** can be directly selected by moving the cursor to the desired word, and leaving the cursor there until the word is selected, which occurs when the timer expires, or by manual intervention. This feature supports rapid selection from a list.

[0039] According to exemplary embodiments of the present invention, multiple words can be entered. FIG. **6** shows an example of two words separated by the "blank space" character entered into the text box window **602**. Long sentences can also be entered. When the length of the entered text exceeds the size of the text box window **602**, the entered text will scroll off to the left. This text is not lost and can be viewed by the scrolling the text box cursor **604**. As the cursor approaches the left side the text will scroll right revealing that portion of text.

[0040] According to some exemplary embodiments of the present invention, remote control devices which are used in conjunction with the pie widget **300** may have a scroll-wheel **110**. The scroll-wheel **110** can be used to perform, among other things, one or more of the following three operations: (1) scroll the text box cursor **304** in the upper text box **302**; (2) scroll the selection in the text list box **306**; and (3) scroll the pie menu slice selection. Initially the wheel is associated with the text box **302**. To change the wheel association to a different Graphical User Interface (GUI) object, the wheel can be pressed as a button. Thus, pressing the scroll wheel **110** will change the scroll wheel association to a different GUI object, e.g., the text list box **306**. Pressing the scroll wheel **110** again will shift the association to the next GUI object, e.g., the pie widget **300**. Pressing the wheel once again will return the association back to the text box **302**. When associated to the pie widget **300**, rotating the wheel will change which sector is selected. According to one exemplary embodiment, after the character "Z", the next rotation of the wheel selects the center of the pie widget **300**. Pausing on the center circle will reset the text entered. The timer can work in this mode in the same manner as previously described for a character selection behavior.

[0041] According to an exemplary embodiment of the present invention, characters can be inserted and deleted anywhere in the text box. The location of the insertion or deletion is controlled by the location of the text box cursor. The user controls the location of the text box cursor by rolling the scroll wheel. Each click of the scroll wheel will move the text box cursor left or right by one character position. FIG. **7** shows the text box cursor positioned within the word "broown". The text box cursor in FIG. **7** is positioned in preparation to delete the extra letter "o".

[0042] According to some exemplary embodiments of the present invention, the pie text entry widget can also include a text-to-voice feature. The toggle button labeled "speak" as shown in FIG. **9** enables the voice response feature. When enabled, each character will be enunciated at the time of entry. This can, for example, replace the change in display (e.g., green to red coloring or changes in highlighting) used to indicate a final character selection in the above-described

embodiments. The character name can be audibly output rather than the sound of the letter. When a space is entered all of the entered text up to that point can be output as voice, in which case the user will hear the sound of the words rather than the names of the letters.

Second Exemplary Embodiment

Zoomable Text Entry Interface

[0043] According to another exemplary embodiment, text can be easily and efficiently entered without a keyboard using a pointing and clicking device in conjunction with a zoomable interface with a visual display. According to these exemplary embodiments of the present invention, a pointer is moved, and a box, for example, containing text can be selected. When the box is selected, the screen zooms in on this selection. The graphics around the box will fade or move toward the display edge as the selected item grows and new graphics (representing subsequent potential selections) will be displayed inside the growing selected box. This zooming action can be repeated as required for each selection until a word (or selectable GUI object) is identified.

[0044] A display containing various GUI elements works in conjunction with a zoomable, keyboardless text entry interface, as shown in FIG. **10**. Exemplary GUI elements illustrated in this example include a request string section **1004**, a directions section **1014**, and a selection window **1002**. Other elements could be added, depending on, for example, the need at a given level of zoom, such as a current word section or a possible word completion list section. The selection window **1002** has a shape **1020** for each character or range of characters, in this example the shapes are squares or rectangles although the present invention is not so limited. The size of the shapes can represent the number of words that are "underneath" the shape. That is, the size can be proportional to the number of words that are possible (feasible) should that block be selected. For example, the area of the box containing "R-S" in FIG. **10** is greater than the area of the box containing the letter "A" because there are more words (or selections) available which begin with the letters "R" and "S" than which begin with the letter "A".

[0045] The user moves a pointer **1008** to select the letter or range of letters that begins their desired word. When the user selects a shape using a selection device such as a mouse or other pointer, the selection window zooms into that shape independently from the main view and reveals other letters, words or phrases which are potential subsequent selections. Selection can occur using any of a variety of methods such as, for example, clicking the selection that is currently being pointed to or using a timer as described above with respect to the pie widget embodiments. Zoomable keyboardless text entries according to these exemplary embodiments reveal subsequent selection options by zooming between different magnification levels. The selection options can, for example, be subsequent character choices or ultimate word or phrase choices. For example, FIG. **11** shows the displayed result after the user selects the character "Z" in FIG. **10** and a zoom is performed to reveal a number of title selections associated with movies that can be accessed via this application. As shown in FIG. **11**, in addition to changing the selection items, other element areas change or become updated based on a user's action. For example, as shown in FIG. **11**, the directions section **1114** has been updated to inform the user as to what actions to perform next, and as before, the pointer **1108** can be moved to select the desired word or phrase. In the illustrated example, the user is pointing to "Title 16", and the interface provides feedback by drawing a box **1126** around the current entry.

[0046] According to other exemplary embodiments of the present invention, words can be entered by using only a pointing device as shown in FIGS. **12**(*a*), **12**(*b*) and **12**(*c*). Therein the interface contains a selection window **1202**, directions section **1214**, request section **1204**, a pointer **1208**, and a section to display the current word and/or list possible completions **1206**. In the selection window **1202** shapes are displayed which are associated with the current letters **1212** that are available for selection. In addition to letters, symbols, numbers, icons, word parts, mixed case letters and any other characters could be used. For example, if the pending word entry were the letters "explana_", one of the selection areas could contain the word fragment "tion". The sizes of the shapes may correspond to the number of words or selections that are feasible if that selection is made.

[0047] In FIG. **12**(*a*), the user selects the shape with the letter "T". This causes the selection window **1202** to zoom into the "T" and reveal choices for the next letter as shown in FIG. **12**(*b*). The aspect ratio and shape of the selected letter are stretched so that only choices for the next character are shown. Also as shown in FIG. **12**(*b*), the interface updates the current word that is being spelled **1216** and lists possible completions **1218**. The user can move the pointer to these completions and select them to finish off the word. In the case illustrated, the user selects the shape with the "O" in it, and the interface animates a zoom into the "O" to reveal another set of shapes with letters as shown in FIG. **12**(*c*). To complete the word "top", the user can select "top" in the list of possible completions **1218** or select the "P" from the selection window **1202**. To assist in usability any of the following modifications could be used either by themselves, or in combination: (1) shapes could be provided which are associated with actions to perform, for example, such actions as either character erasure, or to initiate a search; (2) the selection that the pointer is currently over can be identified by either a highlight, slight enlargement, or performing an animation; and (3) shapes could be colored or otherwise adjusted to provide visual distinctiveness in addition to the indicated character(s) association.

[0048] In another exemplary embodiment of the current invention, the user may need to select from a large list of text items, such as movie names, artists, music album names, phone directory listings, business listings, etc, or the user may need to enter arbitrary text. In the former situation, the user can be presented with a selection window in its zoomed out state. From here the user proceeds to click on the beginning letter or letters of the item that they want to find. In response, the interface animates a zoom operation into the shape containing the letter and reveals a next set of letters or a list of items. The user can then select the desired item or press a go back control to return to the top level zoomed out state. The latter situation is very similar, except at each zoom level, the interface presents subsequent letters that could be concatenated to the word. The display areas of these letters can also correspond to their probability of being next. In addition, those skilled in the art will appreciate that the present invention is equally applicable to embodiments wherein multiple zoom options could exist, e.g., zoom in, zoom out, zoom to any previously viewed level, or partition the screen to show multiple zoom levels simultaneously.

[0049] In another exemplary embodiment of the current invention, the size of each selection shape **1020** is proportional to the likelihood that an available word represented by that selection will ultimately be the word that is selected. This could result in a different shape size than embodiments which size the shape based solely on the number of feasible words represented by that selection. One example of shape sizing using this criterion is sentence entry. At a point in a sentence, many adjectives may be appropriate (feasible), but the number of nouns may be relatively few. Since a user is more likely to pick a noun over a long string of adjectives, the nouns can be represented with larger rectangles. A process that tracks the context and semantics of the environment in which the selection is being made could assign likelihood values to each of the feasible words represented by the selection. This would enhance the experience by improving the prediction of what the user's most likely selection would be. This could be further extended to symbols, numbers, icons, and mixed case letters, etc.

[0050] Based on one or more predetermined criteria, e.g., ultimate probability of selection or raw number of feasible selections, the shapes (e.g., rectangles) can be drawn on the screen using a number of different techniques at each zoom level of the text entry tool. One such technique involves using a treemap algorithm to perform the shape sizing based on the predetermined criteria. An exemplary treemap algorithm is known as a "quantum treemap" algorithm, which is described in the article entitled "Ordered and Quantum Treemaps: Making Effective Use of @d Space to Display Hierarchies" by Benjamin B. Bederson et al., *ACM Transactions on Graphics (TOG)*, Volume 21, Issue 4, October 2002, pp. 833-854, the disclosure of which is incorporated here by reference. Using this algorithm, the number of word or letter choices available at a particular zoom level in the zoomable, keyboardless text entry interface can be separated into bins so that the ratio between the largest to smallest bin is less than roughly a factor of 3 (although this factor can be adjustable) and that the number of bins is limited to a predetermined maximum. These features prevent the treemap algorithm from generating rectangles that are too small to target with a pointing device.

Third Exemplary Embodiment

Rows of Keys with Result Display

[0051] According to yet another exemplary embodiment of the present invention two rows of characters can be displayed proximate the top of a screen that can be used for text entry purposes without the need for a keyboard as shown in FIG. **13**. Among other things, this approach provides various benefits. Firstly, when pointing, it is more efficient to move a cursor in substantially one axis of motion as compared to large, abrupt motion changes. Secondly, by placing the text entry tool toward an edge of the display, the remaining space is maximized to display choices based on text entry. As in the previous embodiments, characters can be selected by positioning a cursor over a desired key and then either waiting for the expiration of a timer or explicitly making a final selection via, e.g., a button press. When text is entered, as shown in FIG. **14**, resulting potential groups of selections can then be displayed and scaled below the rows of text. In this example, the potential selection groups are represented by cover art associated with selectable movies, however it will be appreciated that this is purely illustrative. These groups can be scaled so as to be visually pleasing and to have the user avoid perceiving that anything is missing within the group. Other visually pleasing displays could be used such as, for example, the displays shown in FIGS. **15** and **16**. The content of the groups' changes and becomes more refined as more text is entered and searching occurs as shown in FIGS. **17** and **18**.

[0052] The two rows of characters displayed in this exemplary embodiment are text with a few additional characters. Text characters predominate this exemplary keyboardless text entry interface, since (for some applications) text is the predominant entry type and minimizing the total number of choices will speed up entry. For cases when other entries are needed, a backspace button **1400**, a blank space button **1402**, a back button **1406** and an expand button **1404** are included in this exemplary embodiment of the present invention. The backspace button **1400** erases previously entered text selections in the display box **1408**. The blank space button inserts a space in the display box **1408**. The back button **1406** replaces the current display results with the previous display results and corresponding text entry in display box **1408**. The expand button character **1404** allows access to other characters such as numbers, symbols, etc, by displaying one or more additional rows of characters (not shown).

[0053] Systems and methods for keyboardless text entry according to exemplary embodiments of the present invention can be performed by one or more processors executing sequences of instructions contained in a memory device (not shown). Such instructions may be read into the memory device from other computer-readable mediums such as secondary storage devices. Execution of the sequences of instructions contained in the computer-readable medium and/or memory device causes the processor to operate, for example, as described above to handle keyboardless text entry. In alternative embodiments, hard-wire circuitry may be used in place of or in combination with software instructions to implement the present invention.

[0054] Numerous variations of the afore-described exemplary embodiments are contemplated. For example, other exemplary embodiments of the present invention can contain such features as a vocabulary not limited to any particular set of words (characters, symbols, etc.), and a dictionary assist on words entered. The above-described exemplary embodiments are intended to be illustrative in all respects, rather than restrictive, of the present invention. Thus the present invention is capable of many variations in detailed implementation that can be derived from the description contained herein by a person skilled in the art. All such variations and modifications are considered to be within the scope and spirit of the present invention as defined by the following claims. No element, act, or instruction used in the description of the present application should be construed as critical or essential to the invention unless explicitly described as such. Also, used herein, the article "a" is intended to include one or more items.

1. A method for entering characters into an interface, comprising the steps of:

displaying a text entry tool having a center and a plurality of sectors relative to said center, each of said sectors associated with at least one character;

selecting one of said characters by selecting an associated sector; and

entering said selected one of said characters into said interface in response to a predetermined event occurring subsequent to said selection step.

2. The method of claim 1, wherein each of said sectors is associated with one and only one of said plurality of characters.

3. The method of claim 1, wherein said step of selecting one of said characters further comprises the step of:

positioning a cursor over said associated sector.

4. The method of claim 1, wherein said step of selecting one of said characters further comprises the step of:

moving between said plurality of sectors using a scroll wheel.

5. The method of claim 1, wherein said predetermined event is expiration of a timer which starts after said associated sector has been selected.

6. The method of claim 5, wherein said timer has a value which is manually adjustable.

7. The method of claim 5, wherein said timer has a value which is automatically adjustable based on a user's previous character selection behavior.

8. The method of claim 1, wherein the text entry tool is circular and contains the letters "A" to "Z", each of which are associated with one of said plurality of sectors.

9. The method of claim 3, wherein the cursor can be positioned outside of an area contained within a perimeter of said text entry tool to select a character.

10. The method of claim 1, further comprising the steps of:

displaying characters as they are entered in a text box; and

displaying a list of potential text entries based on previously entered characters

11. An interface input method, comprising the steps of;

selecting one of a plurality of objects provided on a display, said selected object being associated with at least one character from a first group of characters;

zooming into said selected object;

revealing a plurality of additional objects, each associated with one character from

a second group of characters, said second group of characters including those characters which are potentially selectable given said at least one character from said first group; and

selecting one of said plurality of additional objects to enter a text into an interface.

12. The method of claim 11, wherein said objects have a rectangular shape.

13. The method of claim 11, further comprising the step of:

displaying each object with an area that is proportional to the probability of that object being selected.

14. The method of claim 11, further comprising the steps of:

displaying each of said objects at a first magnification level; and

zooming into said additional objects by changing to a second magnification level.

15. An interface input method, comprising the steps of:

selecting one of a plurality of objects provided on a display, said selected object being associated with at least one character from a first group of characters;

zooming into said selected object; and

revealing a plurality of additional objects, each associated with a subsequent selection that is related to the selected at least one character.

16-37. (canceled)

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