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(71) Applicant *(for all designated States except US)*: **TELE COMMUNICATION SYSTEMS, INC.** [US/US]; 275 West Street, Suite 400, Annapolis, MD 21401 (US).

(72) Inventors: **AHUJA, Rajat**; 33 Union Square, Union City, CA 94587 (US). **BANSAL, Ritesh**; 2000 Walnut Ave., B-301, Fremont, CA 94538 (US).

(74) Agent: **BOLLMAN, William, H.**; MANELLI DENISON & SELTER PLLC, 2000 M Street, N.W., 7th Floor, Washington, DC 20036-3307 (US).

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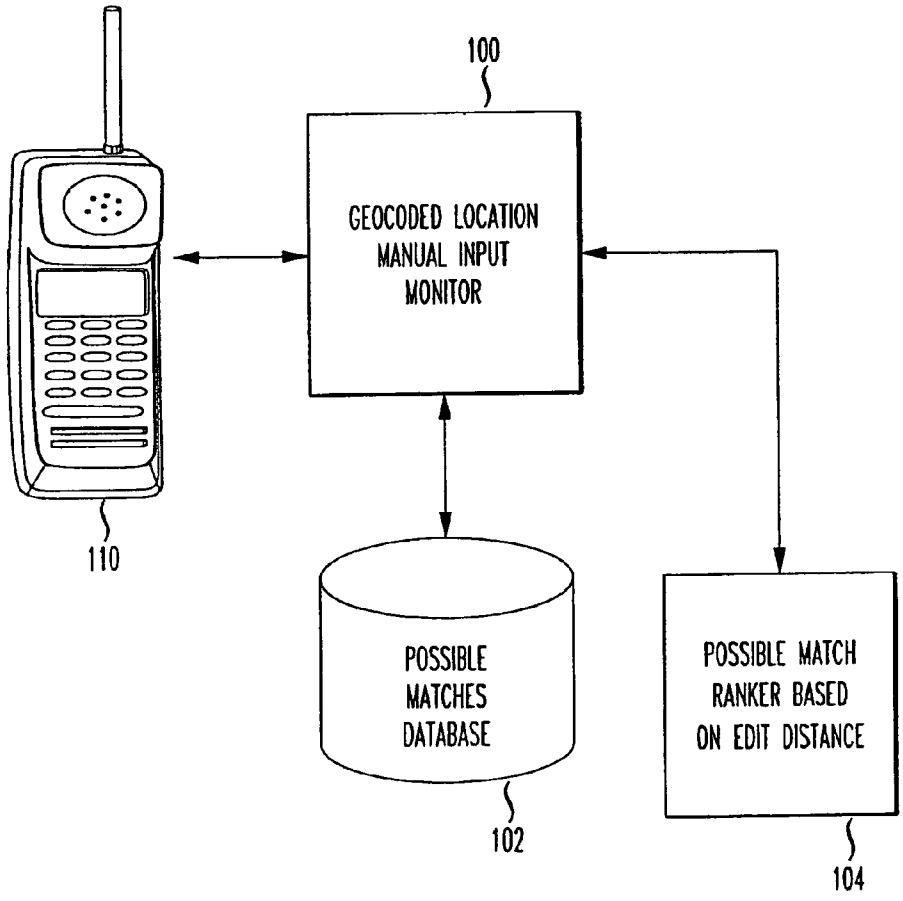
(54) Title: LOCATION INPUT MISTAKE CORRECTION



(57) Abstract: A system for automatically correcting a. mistaken geocoded location input. A wireless device such as a cell phone ranks possible location input based on edit distance, which is a 'confidence factor'. If there is no perfect match, then a list of geocode options is returned, preferably sorted by the score. The 'closeness' is derived by looking at the edit distance to go from the input to the matched address. Edit distance is defined herein as the number of insertion/deletion/replacement operations to go from input location to the possible matched location. In one embodiment, an option list, or 'pick list', may be provided based on an edit distance scoring system. The edit distance scoring system is preferably based on a number of keystrokes difference between the input location name and the possible matched location name.

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LOCATION INPUT MISTAKE CORRECTION

The present application claims priority from U.S. Provisional Application No. 60/798,330, entitled "Location Input Mistake Correction" to Ahuja et al., filed May 8, 2006, the entirety of which is expressly incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to wireless and long distance carriers, Internet Service Providers (ISPs), and information content delivery services/providers and long distance carriers. More particularly, it relates to location based services, and most particularly to navigation using location based services.

2. Background of the Related Art

The demand for wireless communication services are ever increasing in response to a society that is becoming increasingly mobile. As a result, wireless devices, and in particular cell phones, have become ubiquitous with day-to-day life. A majority of people in the United States now own cell phones.

Location services are a more recent advanced feature made available for use with wireless devices, perhaps most notably to provide location of a cell phone. The general goal of location-based services is to automatically provide location-based information to a requesting application. The requesting application may be operating on the wireless device itself, or even on an external application running, e.g., on another device in the wireless or other network. Some exemplary applications that use location services include mapping applications that show interesting places in a vicinity of the wireless device's current global position, and navigation from a current location. Location based services are available for wireless devices such as personal digital assistants

(PDAs) as well as for cell phones.

A geospatial entity object code (Geocode) is code that represents a geospatial coordinate measurement of an exact geographic location on (or above, or below) the earth. Many location-based applications on current wireless phones allow a user of the wireless phone to manually input a geocode location, and get in response a location based service, e.g., navigation to a desired destination.

A geocoded representation is derived from latitude, longitude, altitude, date, local time, global time, and other geospatial attributes, e.g., how the area is coded (number, letter, mixture of both, other); which part of the earth is covered (whole earth, land, water, a continent, a country); what kind of area or location is coded (country, county, airport, railstation, city); and/or whether an area or a point is coded.

In practice, a geocoded location may be entered by the name of the location. While entry of a location name is much more user-friendly than an all-natural numerical input relating to latitude, longitude, etc., it is subject to error when input by the user.

Fig. 3 shows a conventional system for assisting a user manually inputting a location name.

In particular, as shown in Fig. 3, a user manually inputs a first letter **301**, then a second letter **302**, then a third letter **303** of a location name. The conventional system provides possible matches to the first three sequential letters entered by the user, typically presented in alphabetical order.

The conventional system aims to shorten a user's need to enter all letters of a given location name. However, if the user doesn't know how to properly spell the location, particularly in the earliest letters in the location name, the conventional system will not be able to present the user with a small, focused list from which to choose a location. Moreover, if the user has misspelled any letter in the location name, conventional systems quite simply will in fact exclude, rather than include, the intended location name. Furthermore, even with the conventional system aimed at assisting a user to input a geocoded location

correctly in the first place, the conventional system has no way of automatically correcting a mistaken geocode once it is entered by the user.

There is a need for an improved location input technique on a wireless phone.

SUMMARY OF THE INVENTION

In accordance with the principles of the invention, a method and apparatus for automatically correcting an input location including a typographical mistake comprises comparing an input location parameter to a plurality of possible location parameter matches. The plurality of possible location parameter matches are ranked based on edit distance between the input location parameter and the possible location parameter. A best ranked one of the plurality of possible location parameters is provided as a correction to the input location parameter.

BRIEF DESCRIPTION OF THE DRAWINGS

Features and advantages of the present invention will become apparent to those skilled in the art from the following description with reference to the drawings, in which:

Fig. 1 shows a system for automatically correcting a mistaken geocoded location name input, in accordance with the principles of the present invention.

Fig. 2 shows an exemplary method of automatically correcting a mistaken geocoded location name input, in accordance with the principles of the present invention.

Fig. 3 shows a conventional system for assisting a user manually inputting a location name.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

The invention relates to manual or semi-manual input of a geocode location. The present inventors have realized that a geocode location is subject to erroneous manual input by the user, particularly using the keypad of a typical wireless phone. If the user makes a mistake during manual input of a location name, the geocode will likely fail and an error message would be generated. This wastes network resources, not to mention the user's time.

Existing technology does not automatically fix spelling mistakes in geocode location input. Conventional systems may give a user locations matching the contiguous letters entered to that point by the user, but the user must spell the beginning few or more letters of the location correctly to narrow the field of possible choices for location, which may be presented to the user. However, the existing technology is disadvantageous because a user unsure of the spelling of the beginning of a given location's name may be unable to manually enter a location.

Fig. 1 shows a system for automatically correcting a mistaken geocoded location name input, in accordance with the principles of the present invention.

In particular, as shown in Fig. 1, a wireless device such as a cell phone **110** includes a geocoded location manual input monitor **100**, a database of possible location matches **102**, and a possible match ranker that ranks possible location input based on edit distance **104**.

Preferably the geocoded location manual input monitor **100**, possible matches database **102**, and/or possible match ranker based on edit distance module **104** are resident in the wireless device **100**. However, any or all of these elements **100-104** may be alternatively located in a central location, e.g., in a server at the wireless base station in communication with the wireless device **100**.

In accordance with the principles of the present invention, the geocoded location manual input monitor **100** looks for a best match for location input based on edit distance from possible matches in the possible matches

database **102**. Edit distance ranks correction options based on a 'confidence factor'.

In accordance with the principles of the present invention, given a geocode location/address input, the geocoding indices are searched for close matches. All the 'closely' matching entries are evaluated for their closeness to the input, thereby giving a 'confidence factor' or score. If there is no perfect match, then we return a list of geocode options sorted by the score. The 'closeness' is derived by looking at the edit distance to go from the input to the matched address.

Edit distance is defined herein as the number of insertion/deletion/replacement operations to go from input location to the possible matched location. In one embodiment, an option list, or 'pick list', may be provided based on an edit distance scoring system. The edit distance scoring system is preferably based on a number of keystrokes difference between the input location name and the possible matched location name.

For example, a user might intend to input "Maine", but instead incorrectly inputs "Main". The edit distance between the input "Maine" and the possible match "Main", "Main" vs the correct "Maine", is 1 deletion, or 1 keystroke score.

Using the edit distance scoring system, there are three (3) types of keystroke mistakes: an insertion mistake, a deletion mistake, and a replacement of character mistake. In the disclosed embodiments all types of mistakes are ranked equally. It is within the principles of the invention to score the types of mistakes differently. A difference in the type of scoring may be determined empirically.

Automatic correction of an input location may be determined based on various elements of the input location name. For instance, a geocoded location may be input not by name (or in addition to name), but instead by another identifying parameter, e.g., on:

street prefix,
street base name,
street type,
street suffix, and/or
city.

Fig. 2 shows an exemplary method of automatically correcting a mistaken geocoded location name input, in accordance with the principles of the present invention.

In particular, as shown in step **200** of Fig. 2, a user inputs a geocoded location into their wireless device.

In step **202**, the user's manual input is compared to the entries in the possible match database **102**.

In step **204**, entries in the possible match database **102** are ranked based on edit distance to what the user input.

In step **206**, the best ranked match is selected, and presented as the input geocoded location. Preferably the 'best' ranked match is that which has the highest numerical ranking based on edit distance to entries in the possible matches database **102**.

If the user input a correctly spelled location in the first place, the best ranked match, and the highest scoring match with no errors, would be the correct location.

The invention has particular applicability to use in cell phones and other wireless devices.

While the invention has been described with reference to the exemplary embodiments thereof, those skilled in the art will be able to make various modifications to the described embodiments of the invention without departing from the true spirit and scope of the invention.

CLAIMS

What is claimed is:

1. A method of automatically correcting an input location including a typographical mistake, comprising:

comparing an input location parameter to a plurality of possible location parameter matches;

ranking said plurality of possible location parameter matches based on edit distance between said input location parameter and said possible location parameter; and

providing a best ranked one of said plurality of possible location parameters as a correction to said input location parameter.

2. The method of automatically correcting an input location including a typographical mistake according to claim 1, wherein:

said edit distance is a total edit distance including an edit distance of all remaining letters in said possible location parameter.

3. The method of automatically correcting an input location including a typographical mistake according to claim 1, wherein:

said input location parameter is a name of a location.

4. The method of automatically correcting an input location including a typographical mistake according to claim 1, wherein:

said input location parameter is a street prefix of said location.

5. The method of automatically correcting an input location including a typographical mistake according to claim 1, wherein:

said input location parameter is a street base name of said location.

6. The method of automatically correcting an input location including a typographical mistake according to claim 1, wherein:

said input location parameter is a street type of said location.

7. The method of automatically correcting an input location including a typographical mistake according to claim 1, wherein:

said input location parameter is a street suffix of said location.

8. The method of automatically correcting an input location including a typographical mistake according to claim 1, wherein:

said input location parameter is a city name of said location.

9. Apparatus for automatically correcting an input location including a typographical mistake, comprising:

means for comparing an input location parameter to a plurality of possible location parameter matches;

means for ranking said plurality of possible location parameter matches based on edit distance between said input location parameter and said possible location parameter; and

means for providing a best ranked one of said plurality of possible location parameters as a correction to said input location parameter.

10. The apparatus for automatically correcting an input location including a typographical mistake according to claim 9, wherein:

said edit distance is a total edit distance including an edit distance of all remaining letters in said possible location parameter.

11. The apparatus for automatically correcting an input location including a typographical mistake according to claim 9, wherein:

said input location parameter is a name of a location.

12. The apparatus for automatically correcting an input location including a typographical mistake according to claim 9, wherein:

said input location parameter is a street prefix of said location.

13. The apparatus for automatically correcting an input location including a typographical mistake according to claim 9, wherein:

said input location parameter is a street base name of said location.

14. The apparatus for automatically correcting an input location including a typographical mistake according to claim 9, wherein:

said input location parameter is a street type of said location.

15. The apparatus for automatically correcting an input location including a typographical mistake according to claim 9, wherein:

said input location parameter is a street suffix of said location.

16. The apparatus for automatically correcting an input location including a typographical mistake according to claim 9, wherein:

said input location parameter is a city name of said location.

FIG. 1

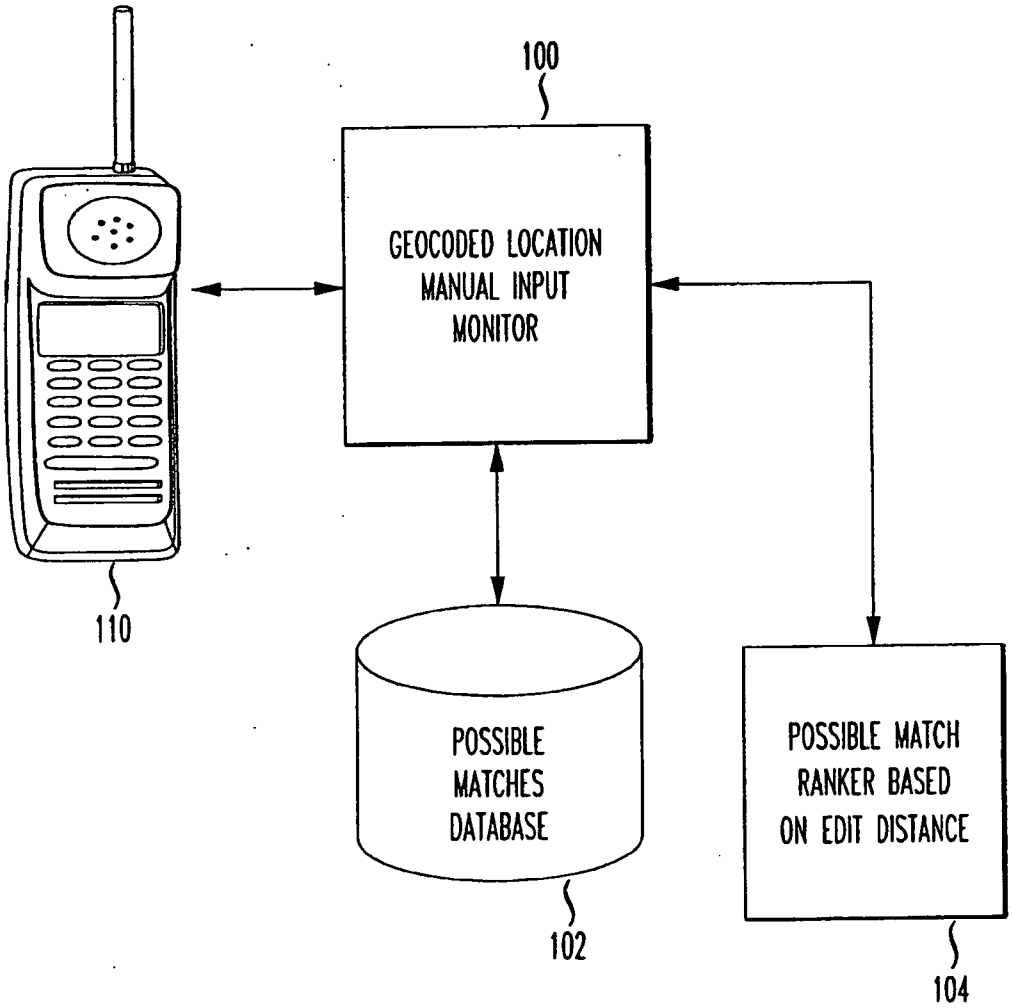
100
GEOCODED LOCATION MANUAL INPUT MONITOR
110
POSSIBLE MATCHES DATABASE
102
POSSIBLE MATCH RANKER BASED ON EDIT DISTANCE
104

FIG. 2

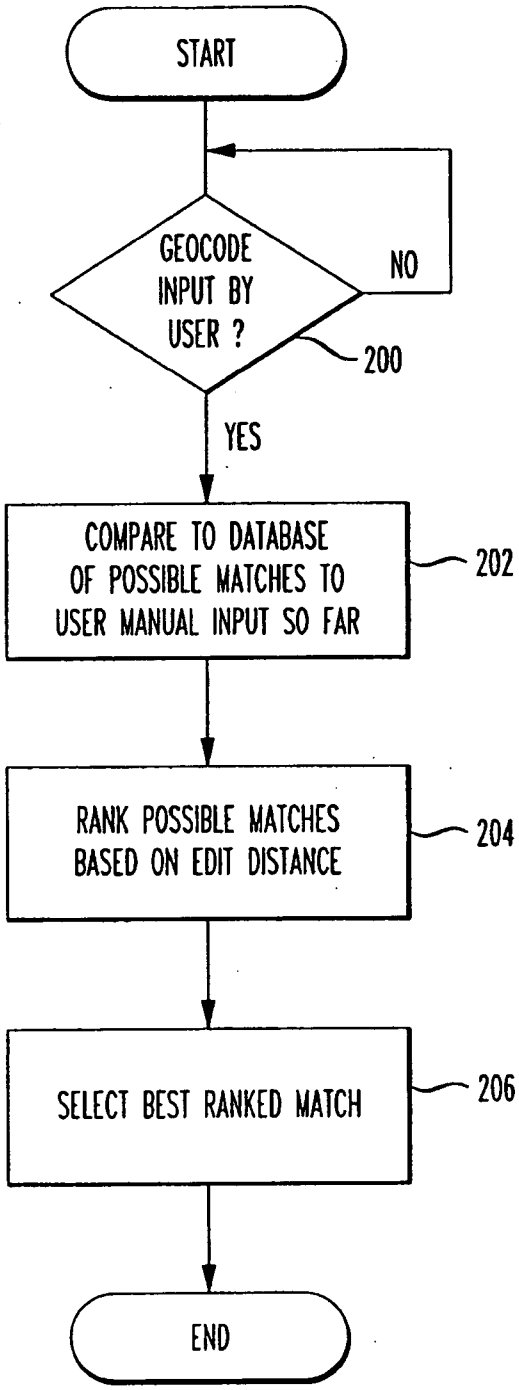
START
GEOCODE INPUT BY USER ?
NO
200
YES
COMPARE TO DATABASE OF POSSIBLE MATCHES TO USER MANUAL INPUT SO FAR
202
RANK POSSIBLE MATCHES BASED ON EDIT DISTANCE
204
SELECT BEST RANKED MATCH
206
END

FIG. 3
(PRIOR ART)