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(54) Abstract Title: **A navigation system, method and database for the system**

(57) A navigation system for guiding a user of a mobile device to a plurality of places P1, P2, P3, P4, P5 comprises: storage means 21 adapted to store a database comprising a plurality of records, each record comprising location data indicative of the location of a respective place P1, P2, P3, P4, P5; a mobile device 1a, 1b, 1c; location determination means, e.g. a base station 3 and a control unit 2, adapted to determine a current location of the mobile device 1a, 1b, 1c; and processing means 22 adapted to use the database and current location to select, according to at least one predetermined criterion, a said place P1, P2, P3, P4, P5 to direct a user to, wherein the mobile device 1a. 1b, 1c is adapted to provide a user with an indication 11a, 11b, 11c, 12a, 12b, 12c arranged to direct the user to the selected place. A corresponding method is disclosed and claimed, along with a database for use in the system or method.

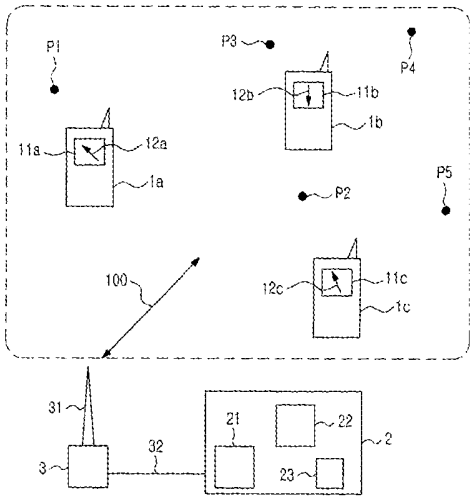

FIG.1

GB 2462299 A

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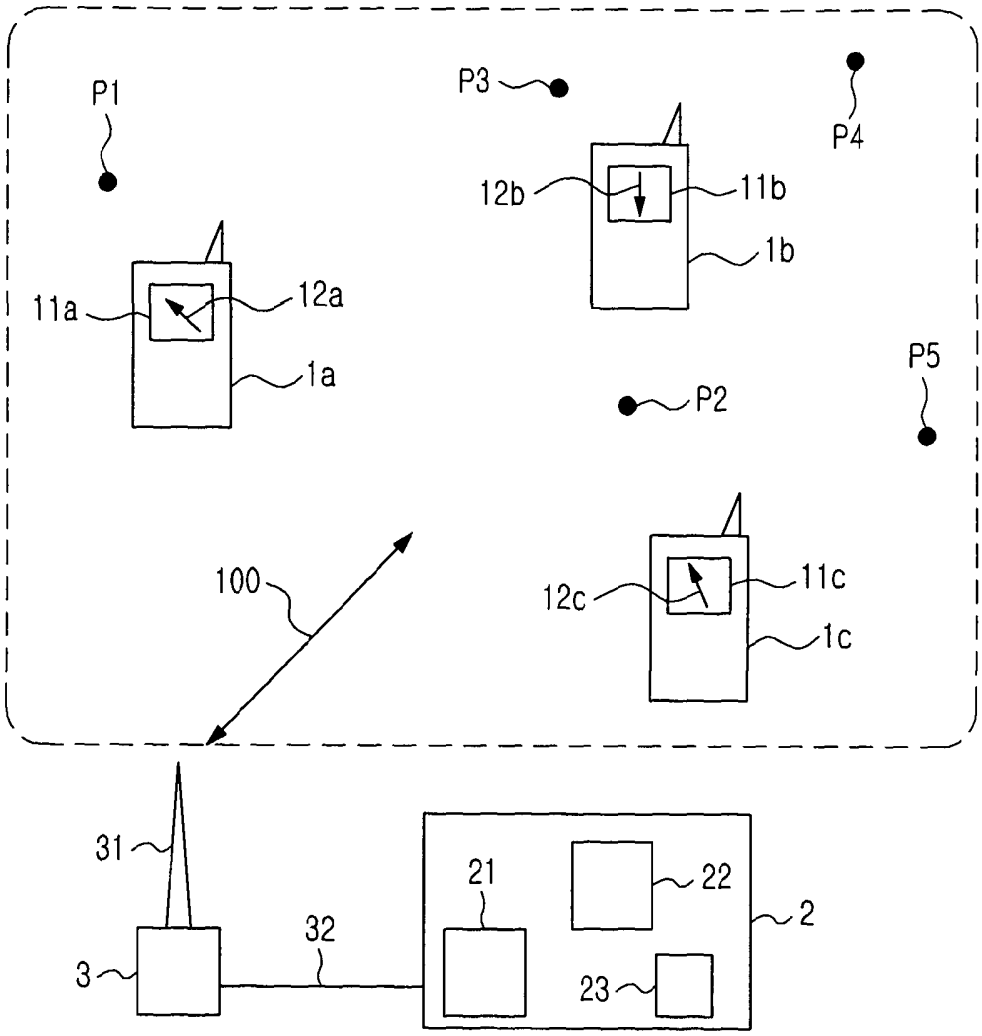

FIG.1

ENTRY	PLACE	LOCATION	CATEGORY	COMMENTS	DATE/TIME OF ENTRY
1	P1	x1, y1	a	-	T1
2	P1	x1, y1	b	-	T2
3	P2	x2, y2	b	-	T3
4	P3	x3, y3	a	-	T4
5	P4	x4, y4	c	-	T5
6	P5	x5, y5	d	-	T6

FIG.2

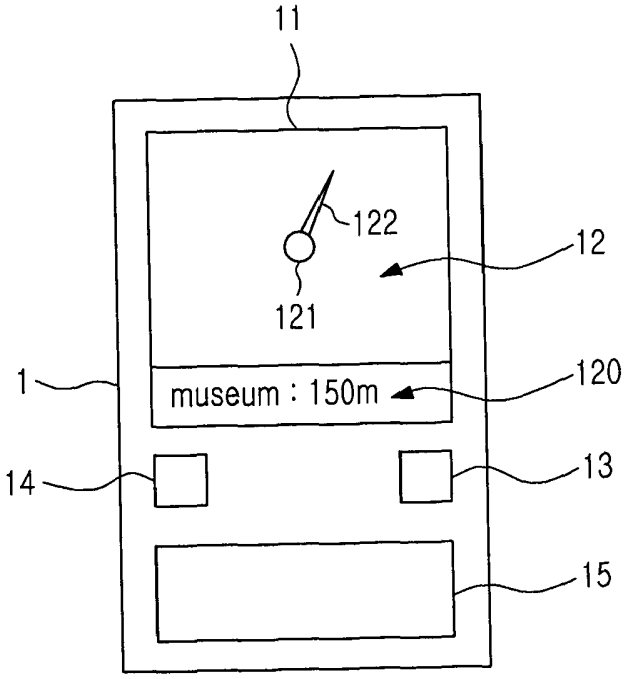
11
122
12
121
1
museum : 150m
120
14
13
15

FIG.3

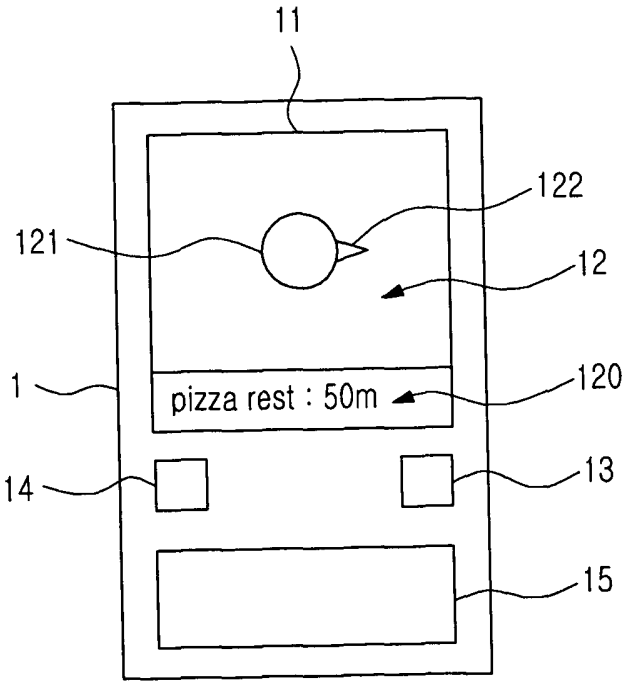
11
122
121
12
1
pizza rest : 50m
120
14
13
15

FIG.4

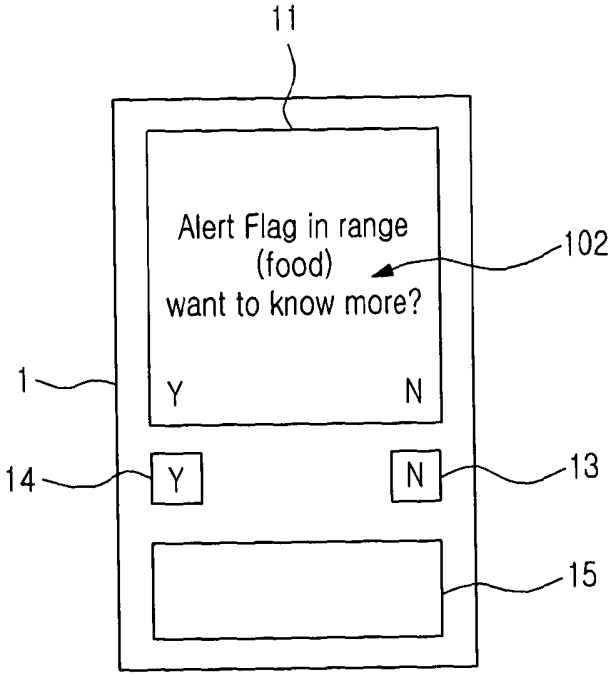
11
Alert Flag in range
(food)
want to know more?
102
1
Y
N
14
Y
N
13
15

FIG.5

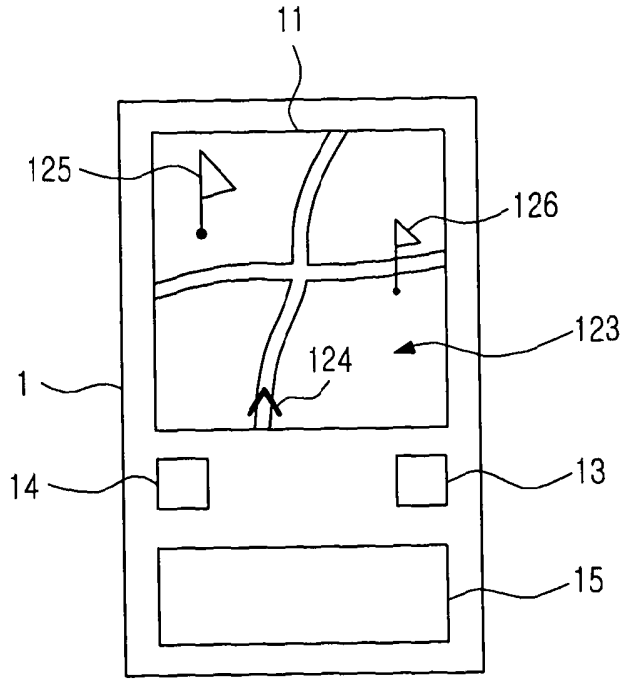
11
125
126
123
124
1
14
13
15

FIG.6

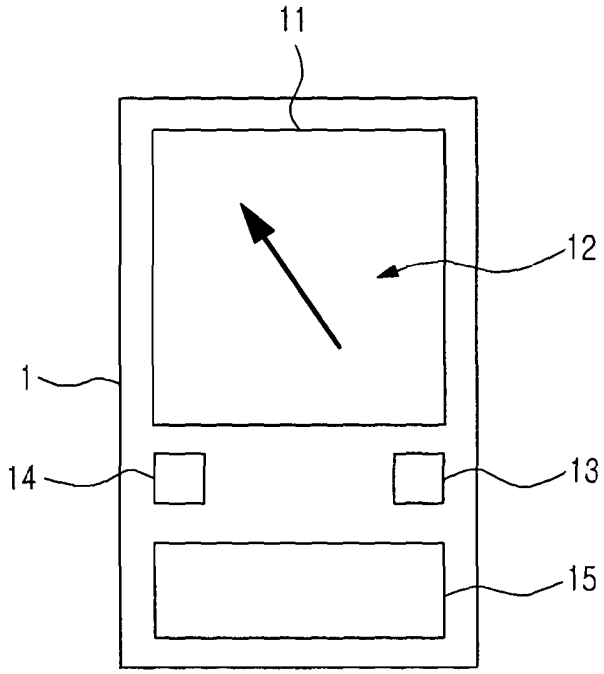

FIG.7

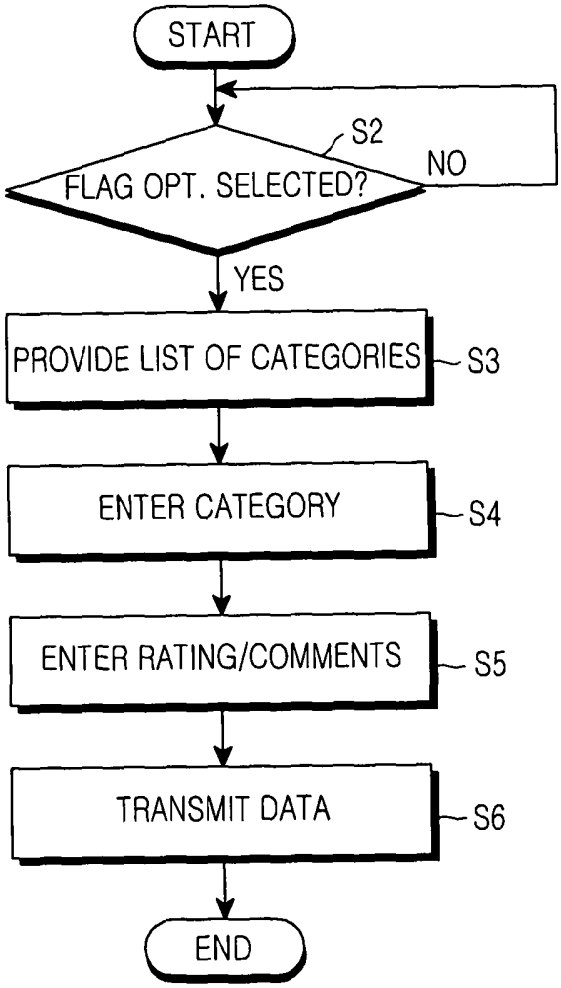
START
S2
FLAG OPT. SELECTED?
NO
YES
PROVIDE LIST OF CATEGORIES
S3
ENTER CATEGORY
S4
ENTER RATING/COMMENTS
S5
TRANSMIT DATA
S6
END

FIG.8

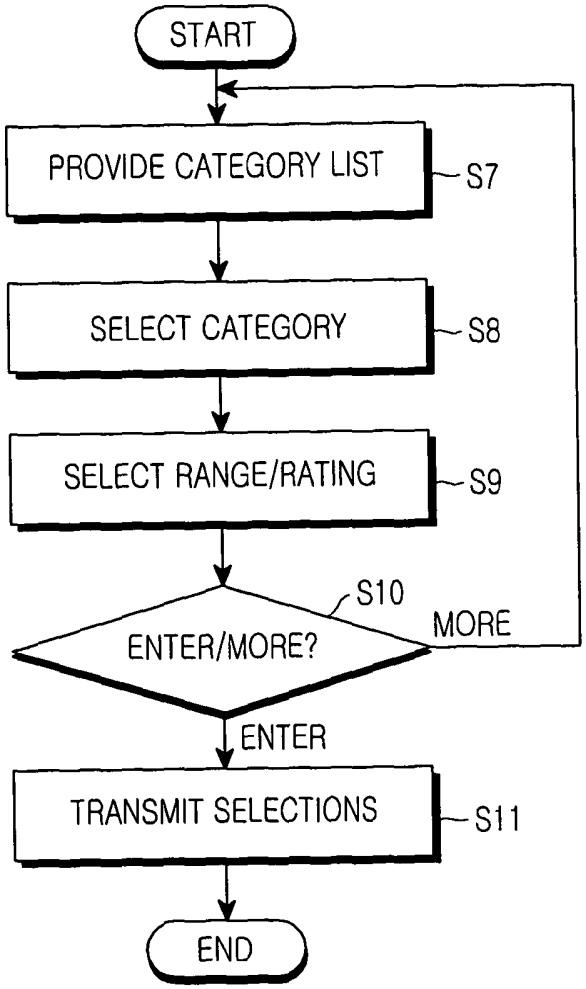
START
PROVIDE CATEGORY LIST
S7
SELECT CATEGORY
S8
SELECT RANGE/RATING
S9
S10
ENTER/MORE?
MORE
ENTER
TRANSMIT SELECTIONS
S11
END

FIG.9

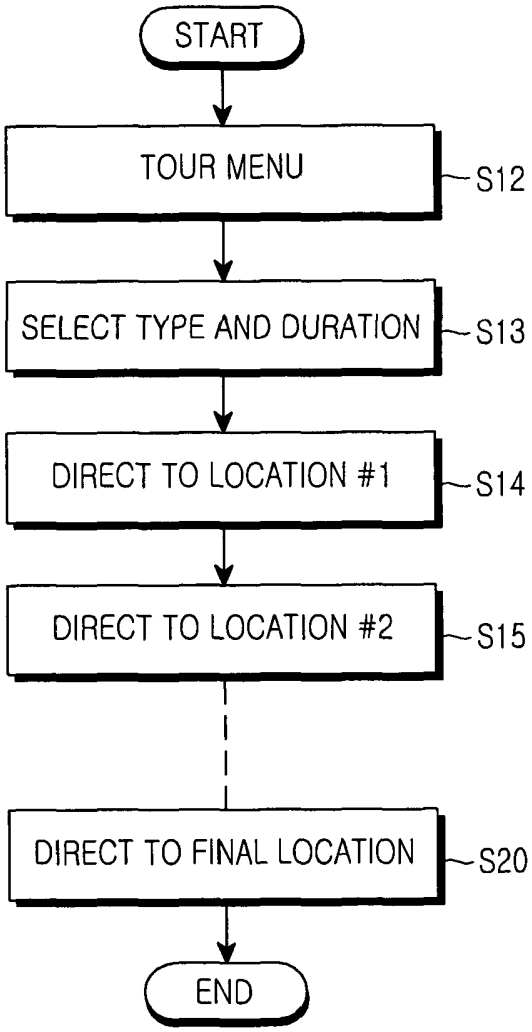
START
TOUR MENU
S12
SELECT TYPE AND DURATION
S13
DIRECT TO LOCATION #1
S14
DIRECT TO LOCATION #2
S15
DIRECT TO FINAL LOCATION
S20
END

FIG.10

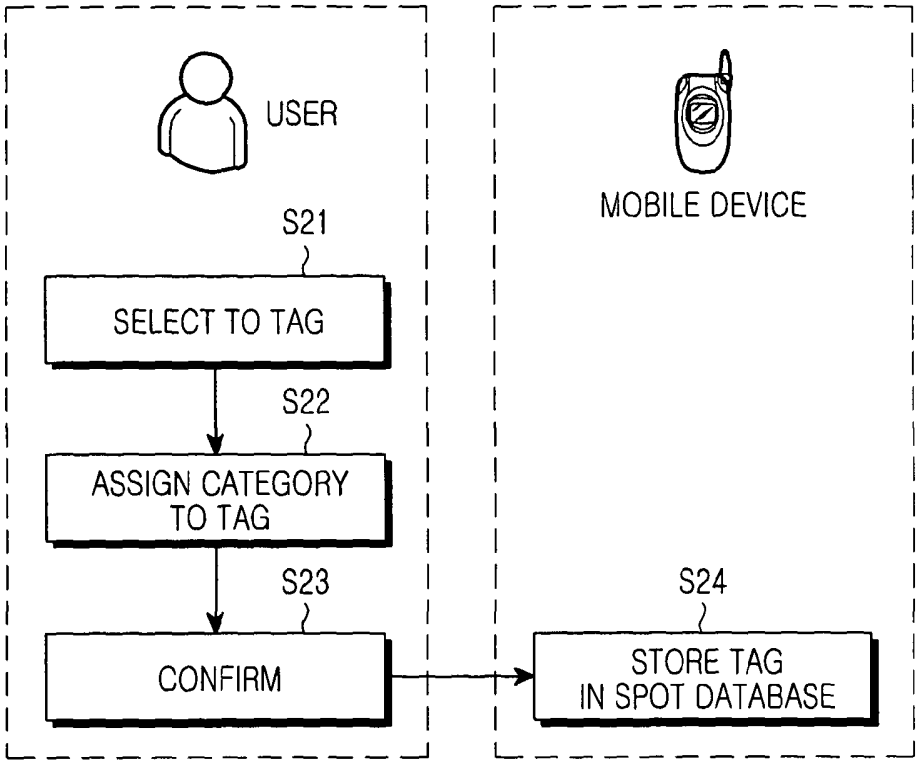
USER
MOBILE DEVICE
S21
SELECT TO TAG
S22
ASSIGN CATEGORY TO TAG
S23
CONFIRM
S24
STORE TAG IN SPOT DATABASE

FIG.11

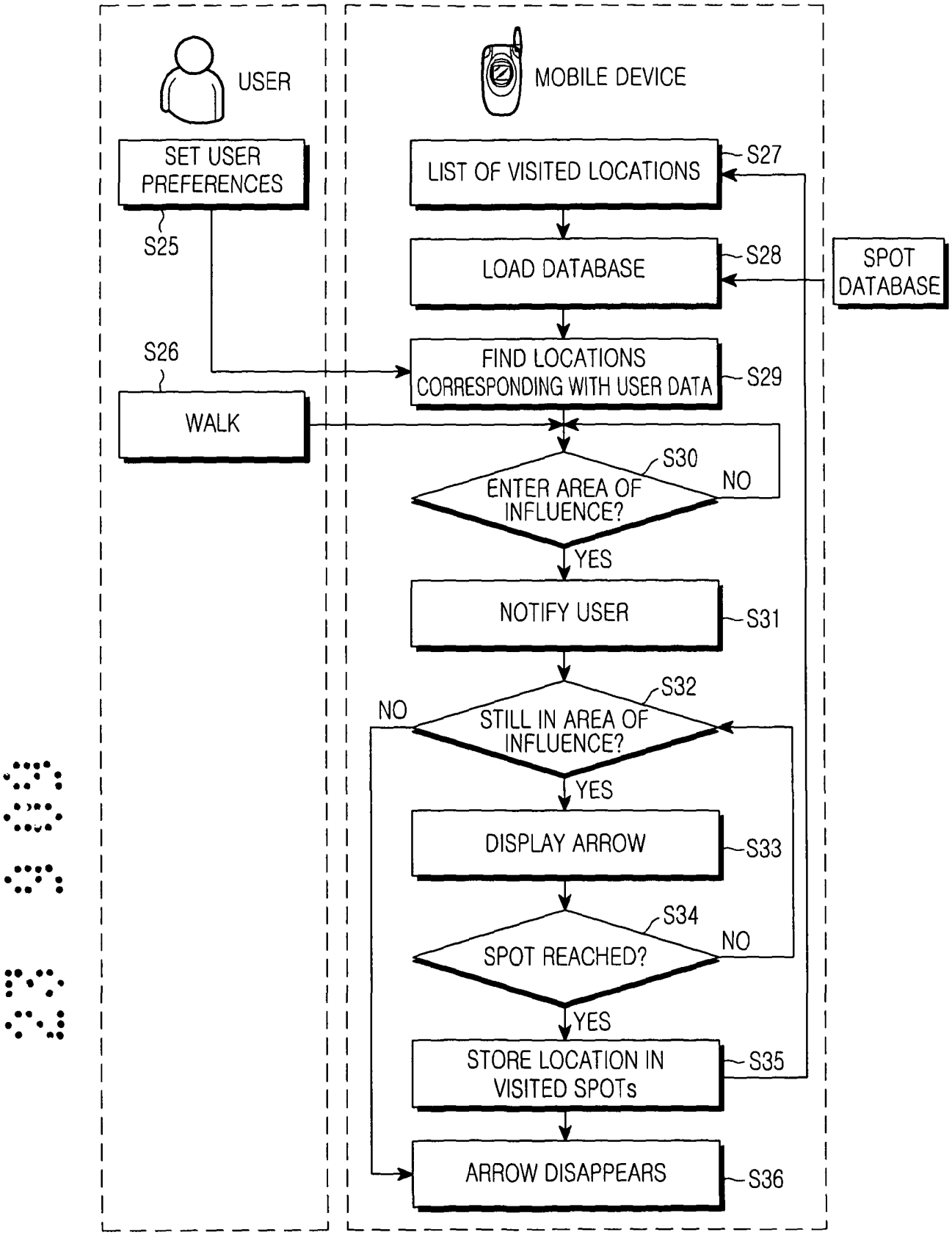
USER
MOBILE DEVICE
SET USER PREFERENCES
S25
S26
WALK
LIST OF VISITED LOCATIONS
S27
LOAD DATABASE
S28
SPOT DATABASE
FIND LOCATIONS CORRESPONDING WITH USER DATA
S29
S30
ENTER AREA OF INFLUENCE?
NO
YES
NOTIFY USER
S31
S32
NO
STILL IN AREA OF INFLUENCE?
YES
DISPLAY ARROW
S33
S34
SPOT REACHED?
NO
YES
STORE LOCATION IN VISITED SPOTs
S35
ARROW DISAPPEARS
S36

FIG.12

Navigation System, Method and Database

Field of the Invention

The present invention relates to navigation systems for guiding users of mobile devices to places, and in particular, although not exclusively, to systems for guiding users of mobile phones to places of potential interest selected from a database.

Background to the Invention

It is increasingly common for people to carry mobile communication devices, such as mobile phones, personal digital assistants and other such equipment, with them as they go about their business and indeed during their leisure time. At the moment, users of such devices have no simple or particularly convenient way of providing information on where they currently are to other people by means of their mobile devices. Of course, it is possible for a user of a mobile device, such as a mobile phone, to send a text message to a friend or colleague, informing that person of where they are. Similarly, the user could use their mobile device to make a voice call to provide that information. However, neither of these methods is particularly simple and convenient.

Furthermore, when people stroll through an urban environment (on business or pleasure, for example when they are tourists in a particular environment) their mobile devices provide no support for their wandering behaviour. Although the mobile devices are there to be used to send or receive calls or messages, these functions are separate from and unrelated to the movement of the user around the environment.

When moving through an environment a user may carry a map, enabling them to know exactly where they are and where they are going. However, if the user does not have a map and instead carries a mobile phone in accordance with the prior art they may be completely aware of their location and indeed where they are going.

There are websites in existence, such as Facebook, that enable people to share information on their movements and experiences with others. Typically, however, these websites require HTTP-access, log in procedures and an extensive amount of text entry to share information and experiences with others.

Mobile navigation systems, particularly for in-car use, are known which provide a user with information on their current location and direction information to guide a user towards a location specified by the user. Such systems typically determine their locations from global navigation satellite systems (GNSS) such as the GPS system for example.

Clearly, for a user already carrying a mobile device, such as a mobile phone, it is inconvenient, cumbersome, and generally undesirable to carry a satellite navigation unit, such as a car "sat-nav" unit, with them as well to guide them as pedestrians. Furthermore, such sat-nav systems are primarily aimed at directing a user to a particular destination selected in advance by the user, and so may be considered inappropriate if a user is just wandering, for example exploring a region on foot as a tourist.

Summary of the Invention

It is an aim of certain embodiments of the invention to solve, mitigate or obviate, at least partly, at least one of the problems and/or disadvantages associated with the prior art. Certain embodiments aim to provide at least one of the advantages described below.

According to a first aspect of the invention there is provided a navigation system for guiding a user of a mobile device to a plurality of places, the system comprising:

storage means adapted to store a database comprising a plurality of records, each record comprising location data indicative of the location of a respective place;

a mobile device;

location determination means adapted to determine a current location of the mobile device; and

processing means adapted to use the database and current location to select, according to at least one predetermined criterion, a said place to direct a user to,

wherein the mobile device is adapted to provide a user with an indication arranged to direct the user to the selected place.

Thus, in contrast to in-car sat-nav systems where a user has to pre-select a destination to be directed to, in the navigation system according to this first aspect of the invention a user of the mobile device is automatically provided with directions to a place selected by the processing means from the database according to at least one predetermined

criterion. For example, the selected place may belong to a category in which the user has registered an interest (such as museums) and as the user moves around he or she can then automatically be alerted to the presence of, and indeed directed to the location of a nearby museum of which he or she was unaware. It will therefore be appreciated that a system embodying this aspect of the invention is able to greatly enhance a user experience as the user moves around an environment.

In certain embodiments the storage means may be entirely separate from and external to the mobile device, for example being comprised in a remote server or other remote apparatus with which the mobile device can communicate using wireless signals. This communication can be provided by any convenient means, for example by a communication system or network comprising an array of base stations or eNode Bs.

In certain embodiments, however, the storage means may be partly external to the mobile device and partly comprises in the mobile device itself. In yet further embodiments, the storage means may be comprised entirely in the mobile device.

In embodiments in which the storage means is external to the mobile device, the mobile device may comprise additional storage means adapted to store a copy of at least part of the database. The mobile device may be adapted to download a copy of all or part of the database from the main storage means. For example, the main database may be very large and cover a vast region or indeed a number of regions. In such cases, the mobile device may be arranged to download and locally store just a portion of the main database corresponding to the current locality of the mobile device (e.g. a particular town, city, or district). Then, the mobile device may itself perform the processing to select a place from that downloaded part of the database to direct the user to.

It will be appreciated that the processing means may be external to the mobile device, be partly external to the mobile device and partly comprised in the mobile device, or indeed be comprises entirely in the mobile device depending on the particular embodiment. Where the processing means is external to the mobile device, a signal identifying at least the location of the selected place is transmitted to the mobile device so that it can then provide the appropriate direction or directions to the user.

In certain embodiments, the location determination means comprises means external to the mobile device for tracking the device and determining where it is at any particular

time. However, in alternative embodiments the mobile device may itself be able to determine its current location. For example, in certain embodiments the mobile device comprises a GNSS receiver (e.g. a GPS receiver) adapted to receive navigation signals from a plurality of satellites and GNSS processing means (such as a GPS processor) adapted to determine the current location of the mobile device from the received navigation signals.

In certain embodiments, each record in the database may just comprise location data indicative of the location of each place to which the mobile device user can be directed. However, in alternative embodiments each record may comprise additional data, such as category data indicative of a category allocated to the respective place. For example, the category data may be used to indicate whether the place is somewhere to eat, drink, shop, or is a place to see (i.e. the place is an attraction, such as a museum, statue, building of historical interest etc). It will be appreciated that these categories are merely examples and other categories may be used in alternative embodiments. For example, additional categories may be used to indicate transport services, stations, transport stops, theatres, cinemas and hotels. In certain embodiments, the user of the mobile device is able to set (or pre-register) certain preferences, indicating which category or categories of place he or she wishes to be directed to. Thus, the user may be on a sightseeing tour, and may only wish to be directed to museums for a particular period. The system is able to automatically take into account this preference, and as the user moves around a city, for example, he or she can be directed from one museum to the next. The user may be able to alter these preferences at any time. Thus, after a period of museum visiting, a user may wish to find a restaurant. By selecting a restaurant category the system is then able to provide directions to suitable nearby establishments. It will also be appreciated that in certain embodiments a user may be able to select within sub-categories, such as restaurants of a particular type.

In certain embodiments the at least one predetermined criterion comprises at least one of:

whether or not a place is within a predetermined distance of the current location;

whether or not the current location is within a predetermined distance of a place;

whether or not the current location is within a defined area around a place;

whether or not a place is within a particular category or categories;

whether or not a place satisfies one or more preferences set by a user of the mobile device.

For example, the processing means may be adapted to search the database for places within, say, 200 metres of the user's current location such that the user is directed to a place or places very close by. The predetermined distance may, for example, be set by a user. Thus, if the user is willing to go further out of their way to find a restaurant or bar or visit a place of interest a larger threshold distance can be set.

In systems using the selection criterion of whether or not the current location is within a predetermined distance of a place, the predetermined distance need not necessarily be the same for all places. For example, if a place is particularly recommended or recommendable, such as a place of outstanding historical interest, then its range of influence can be set very high so that mobile device users may be directed to it from relatively far away. Conversely, if a place is of relatively minor interest, or has not received many recommendations, the predetermined distance used by the processing means can be relatively small so that only users passing very close by are directed to it. In certain embodiments, rather than simply looking for whether the current location is within a predetermined distance of a place, the processing means may determine whether the current location is within a defined area around a place. This area is not necessarily circular (which would pull users in equally from all directions). Instead, it may have another shape, determined for example by taking into account accessibility to it (determined by roads, paths, rivers, bridges, etc). Thus, although a user may be within 50 metres of a particular attraction, the system may not direct a person to that attraction if a river or other barrier lies between the user's current location and the attraction.

As mentioned above, another criteria that can be used by the processing means to determine whether or not to select a place from the database to direct a user to is whether or not that place lies within a category or categories in which the user has registered an interest.

In general, in certain embodiments users may be able to set or enter one or more preferences via their mobile devices, and the system can take these preferences into account in determining which places from the database to direct the user to.

It will be appreciated that a wide variety of types of indication may be used to direct the user to the selected place or places. For example, in certain embodiments the indication comprises at least one of a textual indication and a graphical indication. An example of

a textual indication is "museum; 100 metres ahead" and an example of a graphical indication is an arrow on a screen of the mobile device.

In certain embodiments the indication provided by the mobile device is indicative of both the direction and distance of the selected place from the current location. For example, the indication may comprise a visible component having a size dependent upon the distance of the selected place from the current location (that visible component could be a circle, having a diameter dependent upon the distance) and a visible component indicating the direction of the selected place from the current location (this could be an arrow, line, or other pointer extending from the variable-size circle). An advantage of such indicators is that they provide simple and easy to interpret representations to guide the user to the selected place.

In certain embodiments, the mobile device further comprises a navigation system in accordance with any preceding claim, wherein the mobile device further comprises:

user interface means adapted to provide a user with an option to make an entry, corresponding to said current location, in the database; and

input means operable by a user to select said option,

wherein the mobile device is adapted, in response to a user selecting said option, to transmit data for remote reception and entry into the database, the transmitted data comprising location data indicative of said current location.

This making of an entry corresponding to the current location may also be referred to as tagging the current location. Importantly, these features enable the user to contribute to the database. The user is thus able to share his or her experiences with others via the system, and other mobile device users are able to benefit from those experiences. Indeed, the database in certain embodiments may be constructed entirely from entries provided by respective mobile device users. In such examples, the database thus represents the accumulated experiences and recommendations of a number of users. A particular mobile device user is then able to be guided around an environment by the experiences and recommendations of others. In alternative embodiments, the database may be partly constructed from entries made by mobile device users, the remainder being preset or determined by some other means.

In certain embodiments, the input means is further operable by a user to input and/or select additional data corresponding to the current location (in other words

corresponding to the place having the current location), the transmitted data comprising this additional data. Thus, rather than simply tagging or flagging up a particular location, a user of the mobile device may be able to enter additional information, such as a category the user wishes to allocate to the location or place (for example, the user may indicate that a good Italian restaurant is found at that location) or indeed the user can enter other information such as a level of recommendation or a rating for the place (e.g. an entry of "10 out of 10" in order to recommend a site as a "must-see").

It will be appreciated that by enabling mobile device users to contribute to the database used to guide others around, the system can, advantageously, respond to changes over time. For example, a temporary attraction at a location not previously on the database can be tagged or flagged up by users as they encounter it, so enabling others to be directed to it. Similarly, a new restaurant can be tagged by users and so recommended to others. Similarly, the database can evolve as opinions on particular places change. A deteriorating restaurant may thus disappear from the database as recommendations of it decline over time. Conversely, an improving restaurant can pull in mobile device users from an increasing range as it receives more and more recommendations.

It will be appreciated that in embodiments where mobile device users are able to make entries to the navigation database, the system further comprises database management means adapted to make corresponding entries in the database in response to receiving the respective transmitted data from the or each mobile device. In certain embodiments, the corresponding entry made by the management means comprises data indicative of a time of receipt of the transmitted data. In other words, the entry or update made to the database may be time-stamped. This time information can be used by embodiments in a variety of ways. For example, this time information can be used by the processing means in determining which place or places from the database to select; the predetermined range around a particular place may be determined by the number of entries or flags set for that location within a predetermined period, such as within the last week or month. Thus, entries made before that time may effectively be ignored. In certain embodiments, the database management means may be adapted to delete or ignore database entries after a certain time has elapsed. In this way, the system is able to respond to changes (as discussed above), so that mobile device users are given directions which reflect the current, or at least recent, state of the environment.

In certain embodiments, the system comprises a plurality of mobile devices, each mobile device being operable to make entries in the database as defined above, and to provide a respective user with an indication arranged to direct the user to the respective selected place from the respective current location.

In other words, many users of mobile devices are able to contribute to the database and derive benefit from it, in the form of being directed to locations tagged or flagged by others.

In certain embodiments, the database is arranged to record the number of entries made corresponding to each location (i.e. place). This number of entries, which could also be referred to as tags, flags or hits, can be used to determine the range or area of influence of that place. In other words, the greater the number of tags (which are, of course, recommendations) the larger the area within which a user can be automatically directed to the place.

According to a second aspect of the present invention there is provided a navigation method for guiding a user of a mobile device to a plurality of places, the method comprising:

storing a database comprising a plurality of records, each record comprising location data indicative of the location of a respective place;

determining a current location of the mobile device;

using the database and current location to select, according to at least one predetermined criterion, a said place to direct a user of the mobile device to; and

using the mobile device to provide a user with an indication to direct the user to the selected place.

It will be appreciated that this method may further comprise one or more features corresponding to the optional navigation system features discussed above.

For example, the method may further comprise a method in accordance with claim 21, further comprising:

providing, with the mobile device, a user with an option to make an entry, corresponding to said current location, in the database;

operating input means of the mobile device to select said option; and

in response to a user selecting said option, transmitting data from the mobile device for remote reception and entry into the database, the transmitted data comprising location data indicative of said current location.

The method may further comprise receiving a transmitted data and updating the database using at least a portion of the transmitted data. For example, the transmitted data will typically comprise location data indicative of the current location of the mobile device. If the database does not yet contain an entry for that location then the location data will be entered. However, if the database already contains a record corresponding to that location, the database may be updated with just the additional data containing the transmitted message, for example if the message contains a new category for that location. Another alternative is that both the category and location data are already contained in the database, in which case the database may simply be updated to indicate that yet another user has tagged that location (and that entry may also be time-stamped). Similarly, the method may further comprise receiving the transmitted data and entering at least a portion of the transmitted data into the database.

According to a third aspect of the present invention there is provided a mobile device comprising:

location determination means adapted to determine a current location of the mobile device;

user interface means adapted to provide a user with an option to make an entry, corresponding to said current location, in a database; and

input means operable by a user to select said option,

wherein the mobile device is adapted, in response to a user selecting said option, to transmit data for remote reception and entry into a database, the transmitted data comprising location data indicative of said current location.

This mobile device may again comprise one or more of the optional features described above in relation to the other aspects.

For example, the mobile device may be further adapted to provide a user with an indication to direct the user to a selected location from a current location.

A fourth aspect of the present invention provides a mobile device adapted for use in a navigation system or method in accordance with the first or second aspects of the invention.

According to a fifth aspect of the invention there is provided a method of operating a mobile device, the method comprising:

taking the mobile device to a place;

operating the mobile device to determine a location of said place;

providing, with the mobile device, a user with an option to make an entry, corresponding to said place, in a database;

operating input means of the mobile device to select said option; and

transmitting data from the mobile device for remote reception and entry into a database, the transmitted data comprising location data indicative of said current location.

Again, the method may further comprise one or more of the optional features described above in relation to the other aspects.

For example, the method may further comprise providing, with the mobile device, a user with an indication arranged to direct the user to a location from the current location.

According to a sixth aspect of the present invention there is provided a method of generating a database for use in a navigation system for guiding a user of a mobile device to a plurality of places, the method comprising:

taking a mobile device to a place;

determining the location of said place;

using the mobile device to make an entry in said database, the entry comprising location data indicative of the location of said place.

In certain embodiments, the entry comprises additional data, for example category data indicative of a category allocated to the place by the user.

The method may further comprise taking a plurality of mobile devices to a plurality of places, determining the respective location of each place, and using each of the plurality of mobile devices to make a respective said entry in the database. In other words, the

database may be built up or constructed, at least in part, from feedback provided by a large number of mobile device users.

A seventh aspect of the present invention provides a database generated using a method as defined above, and an eighth aspect of the invention provides the use of such a database to guide a user of a mobile device to a place.

Another aspect of the invention provides a computer program comprising instructions arranged, when executed, to implement a method as claimed in any claim and/or a system or mobile device as claimed in any claim of the specification.

Another aspect of the invention provides machine-readable storage storing a program as defined above.

Brief Description of the Drawings

Embodiments of the invention will now be described with reference to the accompanying drawings, of which:

Fig. 1 is a schematic representation of a navigation system embodying the present invention;

Fig. 2 is a representation of a database embodying the invention, and having been produced by a method embodying the invention;

Figs. 3, 4, 5, 6 and 7 are respective views of a mobile device embodying the invention and providing information in different forms to a user;

Fig. 8 is a flow chart illustrating part of a method embodying the inventions;

Fig. 9 is a flow chart illustrating another part of a method embodying the invention;

Fig. 10 is another flow chart illustrating another part of a method embodying the invention;

Fig. 11 is a schematic representation of steps involved in the setting or placing of a tag in a method embodying the invention; and

Fig. 12 is a schematic representation illustrating steps involved in a method embodying the invention and using a so-called "spot database".

Referring now to Fig. 1, a navigation system embodying the invention comprises a plurality of mobile devices 1a, 1b, 1c (in this example in the form of mobile phones), a

base station 3, having a transmitter/receiver antenna 31, and a control unit 2. The mobile devices and base station are adapted to communicate wirelessly with one another via radio signals indicated generally by arrow 100. The base station is connected to the control unit 2 by means of communication link 32 such that the base station can relay data received from the mobile devices to the control unit, and can send signals from the control unit to the mobile devices. The control unit comprises a main memory or storage means 21 storing a database comprising a plurality of records, each record comprising location data indicative of the location of a respective place P within a region (the region in this example is a city, having an extent generally indicated by the broken line in Fig. 1). The control unit comprises processing means 22 adapted to use the database stored in storage means 21 and information indicative of the current locations of the various mobile devices to select, according to at least one predetermined criterion, a place P to direct the user of each mobile device to. The control unit also comprises an additional memory or storage 23 which stores a user preferences database, that is a database containing data indicative of preferences set or registered by the respective users of the mobile device. The processing means is adapted to use these preferences together with the main database from storage means 21 to determine which places to direct each user to. In this first example, each mobile device 1a, 1b, 1c is adapted to determine its own current location from signals received from a global navigation satellite system. Each mobile device thus comprises a GNSS receiver and GNSS processing means. Having determined its current location, each mobile device is further adapted to transmit location data indicative of that current location to the base station for relaying to the control unit. Thus, the navigation system as a whole knows where each mobile device is at a particular time.

The main database in this example comprises a plurality of records (six records) each record corresponding to a respective one of five places P1-P5 within the city. The contents of the database are shown in Fig. 2. As can be seen from Fig. 2, each record identifies the place, contains location data indicative of the location of that place, also contains data indicative of a category allocated to that place, and also contains time data (in effect a time stamp) indicative of the data/time at which the particular record or entry was made in the database. In this first example, four categories are used to categorise the places; category a corresponds to bars; category b corresponds to restaurants; category c corresponds to hotels; and category d corresponds to museums. As can be seen, there are two records or entries in the database for a place P1. Of course the location data for each of these first two entries is the same, but in the first entry place P1

has been placed in category a indicating that a bar can be found there, and this entry was made at time T1a. The second entry for place P1 indicates category b, so a restaurant can also be found at that place. This second entry was made at a different time, T1b. It should be noted that the database also comprises space for the entry of comments to accompany the location and category information, but this space need not be used.

The processing means 22 is adapted to use the main database in storage means 21 and the current location of a particular mobile device to select, according to at least one predetermined criterion, a place to direct a user of that particular mobile device to. In the case of mobile device 1a, a user has set or registered no preferences, and the system is adapted simply to direct the user to a place on the database that is closest to the current location of mobile device 1a. In the illustrated example, that closest place corresponds to place P1. The control unit has transmitted data indicating the location of place P1 to mobile device 1a, and mobile device 1a is further adapted to provide its user with an indication to direct the user to the selected location P1. Mobile device 1a comprises a screen 11a, and the indication is in the form of an arrow 12a displayed on the screen 11a pointing in the general direction of place P1. In certain embodiments, in order to be able to display such a direction indicator, each mobile device comprises a compass for determining instantaneous orientation.

In contrast, the user of mobile device 1b has registered preferences. The user has requested that he or she should not be directed to category a places (i.e. bars), but has asked to be directed to category b (restaurant) and category c (hotel) locations. Thus, although mobile device 1b is closest to place P3, the processing means takes into account the registered preferences and selects place P2 as the nearest place in category b or c to direct the user of device 1b to. Accordingly, the control unit has sent data indicative of the location of place P2 to mobile device 1b, which displays an arrow 12b on its display 11b to direct the user to place P2.

Lastly, the user of device 1c has registered a preference with the system that it should only be directed to category b locations (i.e. restaurants). The system has determined that place P2 is the closest place to the current location of device 1c and hence device 1c is displaying a directional indicator 12c on its display 11c directing its user to P2.

In certain embodiments, the mobile devices may be unable to influence or alter the contents of the database stored in storage means 21. However, in alternative embodiments, the mobile devices are able to contribute to the database, and this provides the advantage that the database may be built up with data fed back from mobile device users so that they can each benefit from the shared experiences of the others.

For example, in the system shown in Fig. 1, each mobile device 1a, 1b, 1c is further operable to tag or flag up a particular place or location (that is, make an entry in the database for that location or place). To do this, each mobile device comprises user interface means adapted to provide a user with the option to make an entry for the current location in the database. The device also comprises input means operable by a user to select this option, and when the option is taken the mobile device is adapted to transmit data for reception by the base station. This transmitted data can be entered into or otherwise used to update the database, and comprises location data indicative of the current location of the mobile device making the "tag". For example, a user of mobile device 1a may go to another part of the city, and find a small museum which the user finds particularly interesting. At that location, the user is able to operate the mobile device 1a to flag up that location to the database. In addition to providing just the location data indicative of the location of the small museum to the database, the user may be able to operate the mobile device to send category information to be stored along with the location data, and indeed other data such as data indicative of a rating given to the small museum by the user. In this way, the database may build up a library of location data and associated information based on mobile device user experiences. The way that this data is used is very flexible, and can be tailored to suit individual preferences to create a better user experience. For example, a particular mobile device user may specify that he or she only wishes to be directed to places or locations given the highest possible user ratings, e.g. 10 out of 10 "must-see" museums or attractions, or the best restaurants.

Referring now to Fig. 3, this shows a mobile device embodying the invention and which also may be used in navigation systems and methods embodying the invention. It may also be used in the method of generating a database in accordance with another aspect of the invention. The mobile device 1 in this example is a mobile phone having wireless telecommunications capability along with a GPS receiver. The phone 1 has a screen or display 11 and input means 13, 14 and 15 in the form of a plurality of keys. It will be

appreciated that in other embodiments different input means may be employed, for example soft keys, touch sensitive regions, touch pads, a touch sensitive screen etc. The input means in this example comprises one key 13 which a user may press in order to make a database entry corresponding to the current location (in other words the key 13 can be pressed to tag or flag up the current location (or equivalently, a place at the current location)). In certain examples pressing of the input key 13 may be all that is required from the user to flag up the particular location, with its operation resulting in a signal being sent from the phone, that signal simply comprising location data indicative of the current location. This information can then be entered into an appropriate database, for example if the location is one that has not been flagged or tagged before, or if the location has already been tagged the database can be updated to reflect the fact that the location has received another tag or flag (in effect a recommendation by the mobile phone user). In more sophisticated embodiments, however, operation of the input key 13 initiates a tagging process which in addition to eventually transmitting location data from the mobile phone also enables the user to enter or select additional data to be associated with the location, such as a category, comments, or rating. Thus, in more sophisticated embodiments initial operation of the input key 13 can result in the user then being given the option to enter or select further information to associate with the particular current location. In order to enter or select this additional information the user can operate other portions of the input means, for example a plurality of other keys which are indicated generally by reference number 15 on the figure. These could be used, for example, to enter text information for the current location being tagged or flagged up.

Thus, the mobile device shown in Fig. 3 can be used to tag locations, i.e. set tags or flags in a navigation database corresponding to certain locations, and that database may then be accessed by other mobile phone users.

The input means of the mobile device 1 in Fig. 3 also comprises another key 14 which, when pressed, selects or turns on the automatic guidance or direction function of the phone. Thus, when key 14 is pressed the screen 11 of the device 1 provides the user with a visual indication to direct the user to a place selected from a navigation database according to at least one predetermined criteria. This selection process may, as described above, be performed at least partly by processing means in the mobile phone itself, or may be performed by processing means external to the mobile device, the selected place information then being communicated to the mobile device by suitable

means (such as wireless radio communication to its radio interface). The indication 12 to direct the user in this example comprises a plurality of components. Generally in the centre of the screen there is displayed a circular portion or spot onto one whose size is indicative of the proximity of the place or location to which the user is being directed. Generally, the closer the user's current location to the "target" location the larger the spot. The indication 12 also comprises a line, pointer, or arrow 122 extending from the central spot 121 in a direction which generally indicates the direction of the target location from the current location. Thus, to arrive at the automatically selected target location the user of the mobile phone simply has to follow the arrow or pointer component 122. Clearly, the orientation of the arrow 122 may change with time as the user navigates towards the target location, and the size of the spot 121 will also be changing as the user does this. In this example, the indication 12 provided to the user also comprises a textual component 120 displayed on the lower portion of the screen. In this example, the textual component provides more information about the nature and proximity of the target location, and shows that that location is in fact a museum 150 metres away.

Moving on to Fig. 4, this shows the mobile device of Fig. 3 in another situation, where the user has set preferences so that the navigation system of which it is part can direct the user to restaurants. Here, the indication 12 comprises a relatively large central spot 121 and a directional arrow 122, showing that a restaurant is relatively nearby. The textual component of the indication provides further information, namely that the restaurant is a pizza restaurant just 50 metres away.

Moving on to Fig. 5, this shows a mobile phone of the general type illustrated in Figs. 3 and 4, but operating in a slightly different manner. Here, the phone and navigation system of which it is part has been configured so that rather than automatically selecting a place from the navigation database and providing the user with directions to that place from the user's current location, the system instead provides the user with an alert on the screen 11 of the device to let the user know that a tagged or flagged place or location is nearby (i.e. within a particular range). In this example the alert informs the user that a flagged location is in range (and this range may have been preset by the user), but the flag relates to "food" (i.e. the flag corresponds to an eating establishment), and the screen prompts the user to indicate whether he or she would like more information. Key 13 has been allocated as the "no" key, and key 14 has been allocated as the "yes" key. If the user operates key 13, then the alert simply disappears from the

screen, but if the key 14 is pressed the screen may then be arranged to display an indication directing the user to the flagged location to which the user has just been alerted.

Moving on to Fig. 6, this shows another mobile device embodying the invention of the general type shown in Figs. 3, 4 and 5. Here, the display 11 of the device is configured to direct the user to tagged locations in a slightly different manner. In this example, the user has operated the input means of the phone to register with the navigation system that he or she wishes to be directed to recommended art galleries only. The navigation system has then searched its database for recommended art galleries in the vicinity of the user's current location and has passed the locations of those galleries to the mobile device, along with an indication of how highly they have been recommended (this can, for example, be based simply on a number of recommendations, or may be more sophisticated, taking into account the average rating given to the gallery by users making corresponding entries on the database). This information received from the navigation system is then displayed on the mobile device display 11 in the general manner shown. The display 11 provides the user with a simplified map 123 of the user's current environment, with the user's position and current direction being shown as an arrow 124. On this simplified map 123 flags 125, 126 are displayed indicating the positions of just recommended galleries in the displayed portion of the map. The size of each flag gives an indication of how highly that museum has been recommended, thus the user can instantly see in the illustrated example that the gallery indicated by flag 125 is the more highly recommended of the two. This simple graphical representation provides the user with an easy way to visit highly recommended places of the category in which he or she has registered an interest.

Referring now to Fig. 7, this shows another mobile device 1 embodying the invention and operating as part of a navigation system also embodying the invention. Here, the user has selected a "mystery tour" mode, in which the navigation system automatically guides the user to a series or sequence of places/locations without providing the user with any information in advance regarding what those places or attractions are. The system as a whole simply monitors where the mobile device 1 is at a particular time, and selects a "next" location automatically from its database according to at least one criterion. The user is then provided with a simple indication 12 in the form of an arrow to guide the user to the selected next location. In this particular example the arrow 12 tells the user in which direction to move only, and gives no information as to how far the next location is

or what can be found there. It will be appreciated that this kind of system can provide the user of a mobile device with an entertaining means of exploring an environment with which he or she may not be familiar.

Moving on to Fig. 8, this shows a method of entering a flag for a particular location using a mobile device. The method can also be referred to as a tagging method or part of a method for generating or updating a database. Step S1 is the start of the method, followed by step S2 in which the mobile device determines whether a flag option has been selected by a user of the mobile device (e.g. has the user operated input means to indicate that he or she wishes to flag or tag the current location). If the flag option has been selected, the method proceeds to step S3 in which the user is provided with a list of categories which may be associated with the current location. In step S4, the user enters one or more categories for the current location. In step S5, the user is able to enter additional information, for example a rating or comments on the place at the current location. Then, in step S6 data is transmitted from the mobile device for remote reception and use in generating or updating a database. The transmitted data comprises location data indicative of the current location of the mobile device, together with information regarding the category or categories selected by the user and any additional information.

Moving on to Fig. 9, this shows a flow chart illustrating steps of a method which may be used in embodiments of the invention by a user to register preferences which a navigation system may use when selecting places from a database to direct the user to. After the initial start step S1, the user is provided with a list of categories in step S7. This is a list of categories of places or locations that the user might be interested in. In step S8, the user selects one of these categories (in other words, the user here is indicating that he or she would like to be directed to locations or places within that category). In step S9, the user is able to select or enter a range or rating to be associated with the selected category. By selecting or entering a particular range, the user is telling the system that he or she wishes to be directed to locations or places within the selected category but only within that range of his current location. By providing the system with rating information, the user can additionally tell the system that he or she wishes to be directed only to places or locations in the selected category, within the selected range, and which meet the specified rating (i.e. level of recommendation). For example, a user may follow the method shown in Fig. 9 to tell the system that he or she wishes to be directed to restaurants within 500 metres of current

location that have been given an average rating of at least 8 out of 10. In step S10 the user is given the option either simply to transmit the selection data from the mobile device or to add more data by selecting a further category or categories, and associated range or rating information. Finally, in step S11 the mobile device transmits data for remote reception. That data can then be used to generate or update a user preferences database, for example of the kind stored in storage means 23 of the navigation system of Fig. 1.

Moving on to Fig. 10, this is a flow chart illustrating part of a navigation method in accordance with another embodiment of the invention. After the start step S1, the user of a mobile device is provided with a tour menu in step S12. In step S13, the user is able to select a type of tour and a desired duration of that tour. Then, the user is automatically directed to a series of locations in steps S14 to S20, those locations having been selected from a navigation database embodying the invention using the start location of the user and predetermined criteria including the type of tour selected and the duration. For example, a user may have selected an architecture tour, lasting two hours. The system is then able to select tagged locations of architectural interest from the database, with the number of places selected and their locations being determined by the start location and the desired duration of the tour.

It will be appreciated that certain embodiments of the invention provide a mobile navigation application to tag locations and also to find locations tagged by others. Certain embodiments provide a user-initiated feedback/tagging application for locations in an environment such as a city, coupled to a pedestrian navigation system.

Embodiments of the invention enable users to share locations that they find interesting with other users. They enable users to share locations by two simple actions on their mobile phone, namely choosing to tag a location, and then assigning a category to the tag (for example, assigning one of three categories). This provides a simple and convenient interface to share experiences with others. In other words embodiments of the invention are able to lower the threshold to share experiences.

Embodiments of the invention also provide users with an unobtrusive, intuitive and explorative interface. For example, simply by means of a simple arrow on the screen of his or her mobile device, the user can be directed towards a location where there is

something interesting. The information in certain embodiments is kept simple, challenging the user to explore by himself/herself.

Embodiments of the invention enable users to explore cities and other locations by indirectly using the feedback of other users, but at the same time they have the opportunity to share their own experiences. In this way, embodiments of the invention are able to provide a lively and dynamic way of exploring environments.

Referring now to Fig. 11, this is a schematic illustration of some of the steps involved in the placing of a tag in methods embodying the invention. A user may first select a tagging option instead S21, and then may assign a category to the tag in step S22. In this example the user is able to assign one of three categories, these being (1) "eat and drink"; (2) "buy"; and (3) "see". The user confirms his or her selections in step S23 and then in step S24 the tag is stored by the mobile device in a database, which we shall refer to as a spot database in that it contains information on spots or places that have been tagged by the user and indeed other users of mobile devices. The tag contains the following information: the co-ordinates of the tagged location; the date on which the tag is made or entered in the database; and the category assigned to the tag. The mobile device may store the tag in a spot database held in its own memory, or may transmit the tag information to a remote database stored externally.

Referring now to Fig. 12, this shows some of the steps in another method embodying the invention. In step S25 a user sets his or her preferences. In this example those user preferences are category and how many times a spot (i.e. particular location or place) has been tagged. The system stores the spot database which does several things; it keeps track of all locations that have been tagged; it calculates how large the area of influence becomes for a particular spot, depending on how many tags have been placed on a certain spot (the area generally increasing as the number of tags increases); it merges areas of influence when spots are close and in the same category; and it deletes tags after a certain amount of time. In terms of steps involving the mobile device, in step S27 the mobile device maintains a list of locations visited by itself. In step S28 the mobile device loads the database (i.e. it can download all or part of the spot database for use in directing the user). In step S29 the mobile device uses processing means to find locations within the loaded database that correspond with the user data (i.e. correspond with the preferences set by the user). In other words, the mobile device here is looking for tagged locations that are in the category or categories

selected by the user and which have been tagged (hence recommended) by at least the minimum number of users specified by the current user. The user may then carry the mobile device around with him or her as he or she walks around an environment in step 26. As the user moves around the environment, the mobile device in step S30 then determines whether the user has entered an area of influence corresponding to one of the identified (i.e. selected) locations from the database. As will be appreciated from the above description, the area of influence for a particular location may itself be a function of the number of times that location has been tagged, or indeed of other factors. In the illustrated embodiment, if the user has entered an area of influence, the first thing the mobile device then does is to notify the user in step S31. For example, the user may be notified by means of a vibration and/or a sound signal, and/or by a visual indication on the mobile device display. If it is determined that the user is still in the area of influence (in step S32) then a guiding arrow is displayed on the user's mobile device in step S33. In certain embodiments the displayed arrow may have a component which grows as the distance between the user and the spot to which he or she is being directed decreases. For example, this component may be a circle or spot at the base of the arrow. In step S34 it is determined whether the selected spot has been reached. If not, and the user is still in the area of influence of that tagged spot the arrow is continued to be displayed. Its direction and size may have changed in response to movement of the user. Alternatively, if the spot has been reached, information to that effect can be stored in the mobile device memory. In other words, the mobile device may store the current location in the database of visited spots or locations. Finally, the arrow which was directing the user to the spot may then disappear in step S36.

It will be appreciated that embodiments of the present invention can be realized in the form of hardware, software or a combination of hardware and software. Any such software may be stored in the form of volatile or non-volatile storage such as, for example, a storage device like a ROM, whether erasable or rewritable or not, or in the form of memory such as, for example, RAM, memory chips, device or integrated circuits or on an optically or magnetically readable medium such as, for example, a CD, DVD, magnetic disk or magnetic tape or the like. It will be appreciated that the storage devices and storage media are embodiments of machine-readable storage that are suitable for storing a program or programs comprising instructions that, when executed, implement embodiments of the present invention. Accordingly, embodiments provide a program comprising code for implementing a system or method as claimed in any one of the claims of this specification and a machine-readable storage storing such a program.

Still further, such programs may be conveyed electronically via any medium such as a communication signal carried over a wired or wireless connection and embodiments suitably encompass the same.

Throughout the description and claims of this specification, the words "comprise" and "contain" and variations of the words, for example "comprising" and "comprises", means "including but not limited to", and is not intended to (and does not) exclude other moieties, additives, components, integers or steps.

Throughout the description and claims of this specification, the singular encompasses the plural unless the context otherwise requires. In particular, where the indefinite article is used, the specification is to be understood as contemplating plurality as well as singularity, unless the context requires otherwise.

Features, integers, characteristics, compounds, chemical moieties or groups described in conjunction with a particular aspect, embodiment or example of the invention are to be understood to be applicable to any other aspect, embodiment or example described herein unless incompatible therewith.

It will be also be appreciated that, throughout the description and claims of this specification, language in the general form of "X for Y" (where Y is some action, activity or step and X is some means for carrying out that action, activity or step) encompasses means X adapted or arranged specifically, but not exclusively, to do Y.

CLAIMS

1. A navigation system for guiding a user of a mobile device to a plurality of places, the system comprising:

storage means adapted to store a database comprising a plurality of records, each record comprising location data indicative of the location of a respective place;

a mobile device;

location determination means adapted to determine a current location of the mobile device; and

processing means adapted to use the database and current location to select, according to at least one predetermined criterion, a said place to direct a user to,

wherein the mobile device is adapted to provide a user with an indication arranged to direct the user to the selected place.

2. A navigation system in accordance with claim 1, wherein the storage means is external to the mobile device.

3. A navigation system in accordance with claim 2, wherein the mobile device comprises additional storage means adapted to store a copy of at least part of the database.

4. A navigation system in accordance with any preceding claim, wherein the mobile device comprises a Global Navigation Satellite System (GNSS) receiver adapted to receive navigation signals from a plurality of satellites and GNSS processing means adapted to determine the current location of the mobile device from the received navigation signals, the location determination means comprising said GNSS receiver and GNSS processing means.

5. A navigation system in accordance with any preceding claim, wherein each said record further comprises category data indicative of a category allocated to the respective place.

6. A navigation system in accordance with any preceding claim, wherein said at least one predetermined criterion comprises at least one of:

whether or not a place is within a predetermined distance of the current location;

whether or not the current location is within a predetermined distance of a place;

whether or not the current location is within a defined area around a place;

whether or not a place is within a particular category or categories;

whether or not a place satisfies one or more preferences set by a user of the mobile device.

7. A navigation system in accordance with claim 6, wherein the processing means is adapted to determine said defined area.

8. A navigation system in accordance with claim 6 or claim 7, wherein the mobile device is operable to set said one or more preferences.

9. A navigation system in accordance with any preceding claim, wherein said indication comprises at least one of a textual indication and a graphical indication.

10. A navigation system in accordance with any preceding claim, wherein said indication is indicative of the direction and distance of the selected place from the current location.

11. A navigation system in accordance with claim 10, wherein said indication comprises a visible component having a size dependent upon the distance of the selected place from the current location, and a visible component indicating the direction of the selected place from the current location.

12. A navigation system in accordance with any preceding claim, wherein the mobile device further comprises:

user interface means adapted to provide a user with an option to make an entry, corresponding to said current location, in the database; and

input means operable by a user to select said option,

wherein the mobile device is adapted, in response to a user selecting said option, to transmit data for remote reception and entry into the database, the transmitted data comprising location data indicative of said current location.

13. A navigation system in accordance with claim 12, wherein the input means is further operable by a user to input and/or select additional data corresponding to said current location, the transmitted data comprising said additional data.

14. A navigation system in accordance with claim 13, wherein said additional data comprises category data indicative of a category allocated by the user to a place at the current location.

15. A navigation system in accordance with any one of claims 12 to 14, comprising database management means adapted to make a corresponding entry in the database in response to receiving said transmitted data from the mobile device.

16. A navigation system in accordance with claim 15, wherein the corresponding entry made by the management means comprises data indicative of a time of receipt of the transmitted data.

17. A navigation system in accordance with claim 16, wherein the management means is further adapted to delete an entry from the database a predetermined time after receipt of the corresponding transmitted data.

18. A navigation system in accordance with any one of claims 12 to 17, comprising a plurality of said mobile devices, each mobile device being operable to make entries in the database and to provide a respective user with an indication arranged to direct the user to the respective selected place from the respective current location.

19. A navigation system in accordance with claim 18, wherein the database is arranged to record the number of entries made corresponding to each location.

20. A navigation system in accordance with claim 19, wherein the processing means is adapted to determine a respective defined area around each place according to the number of entries made corresponding to the location of that place, and to use the defined areas to select a place to direct a user to.

21. A navigation method for guiding a user of a mobile device to a plurality of places, the method comprising:

storing a database comprising a plurality of records, each record comprising location data indicative of the location of a respective place;

determining a current location of the mobile device;

using the database and current location to select, according to at least one predetermined criterion, a said place to direct a user of the mobile device to; and

using the mobile device to provide a user with an indication to direct the user to the selected place.

22. A method in accordance with claim 21, further comprising:

providing, with the mobile device, a user with an option to make an entry, corresponding to said current location, in the database;

operating input means of the mobile device to select said option; and

in response to a user selecting said option, transmitting data from the mobile device for remote reception and entry into the database, the transmitted data comprising location data indicative of said current location.

23. A method in accordance with claim 22, further comprising receiving the transmitted data and updating the database using at least a portion of the transmitted data.

24. A method in accordance with claim 22 or claim 23, further comprising receiving the transmitted data and entering at least a portion of the transmitted data into the database.

25. A mobile device comprising:

location determination means adapted to determine a current location of the mobile device;

user interface means adapted to provide a user with an option to make an entry, corresponding to said current location, in a database; and

input means operable by a user to select said option,

wherein the mobile device is adapted, in response to a user selecting said option, to transmit data for remote reception and entry into a database, the transmitted data comprising location data indicative of said current location.

26. A mobile device in accordance with claim 25, the mobile device being further adapted to provide a user with an indication arranged to direct the user to a location from a current location.

27. A mobile device adapted for use in a navigation system or method in accordance with any one of claims 1 to 24.

28. A method of operating a mobile device, the method comprising:

taking the mobile device to a place;

operating the mobile device to determine a location of said place;

providing, with the mobile device, a user with an option to make an entry, corresponding to said place, in a database;

operating input means of the mobile device to select said option; and

transmitting data from the mobile device for remote reception and entry into a database, the transmitted data comprising location data indicative of said current location.

29. A method in accordance with claim 28, further comprising:

providing, with the mobile device, a user with an indication arranged to direct the user to a location from the current location.

30. A method of generating a database for use in a navigation system for guiding a user of a mobile device to a plurality of places, the method comprising:

taking a mobile device to a place;

determining the location of said place;

using the mobile device to make an entry in said database, the entry comprising location data indicative of the location of said place.

31. A method in accordance with claim 30, wherein the entry comprises additional data.

32. A method in accordance with claim 31, wherein the additional data comprises category data indicative of a category allocated to the place by the user.

33. A method in accordance with any one of claims 30 to 32, the method further comprising taking a plurality of mobile devices to a plurality of places, determining the respective location of each place, and using each of the plurality of mobile devices to make a respective said entry in the database.

34. A database generated using a method in accordance with any one of claims 28 to 33.

35. Use of a database in accordance with claim 34 to guide a user of a mobile device to a place.

36. A computer program comprising instructions arranged, when executed, to implement a method as claimed in any preceding claim and/or a system or mobile device as claimed in any preceding claim.

37. Machine-readable storage storing a program as claimed in claim 36.

Application No: GB0814029.5 **Examiner:** Mr Kevin Hewitt

Claims searched: 1 to 24 **Date of search:** 27 November 2008

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1,2,4-6, 8-10,21	EP 0995973 A2 (NOKIA CORPORATION) See especially paragraphs [001] to [0017], and all Figs.
X	1-4,6,9, 10,21	US 2008/0114536 A1 (TEASLEY) See especially Abstract and all Figs.
X	1,4-6,9, 10,21	US 5987375 A (TAMAI) See especially Abstract, Column 1 line 14 to Column 2 line 31, and all Figs.
X	1	GB 2298539 A (DEEHAN) See especially Abstract and all Figs.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

G1F

Worldwide search of patent documents classified in the following areas of the IPC

G01C

The following online and other databases have been used in the preparation of this search report

WPI; EPODOC

International Classification:

Subclass	Subgroup	Valid From
G01C	0021/34	01/01/2006
G01C	0021/30	01/01/2006