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Altman et al.

(54) MOBILE DATING SYSTEM INCORPORATING USER LOCATION INFORMATION

(75) Inventors: **Samuel H. Altman**, Menlo Park, CA (US); **Nicholas T. Sivo**, Palo Alto, CA (US)

Correspondence Address:
COURTNEY STANIFORD & GREGORY LLP
P.O. BOX 9686
SAN JOSE, CA 95157

(73) Assignee: **Flipt, Inc**

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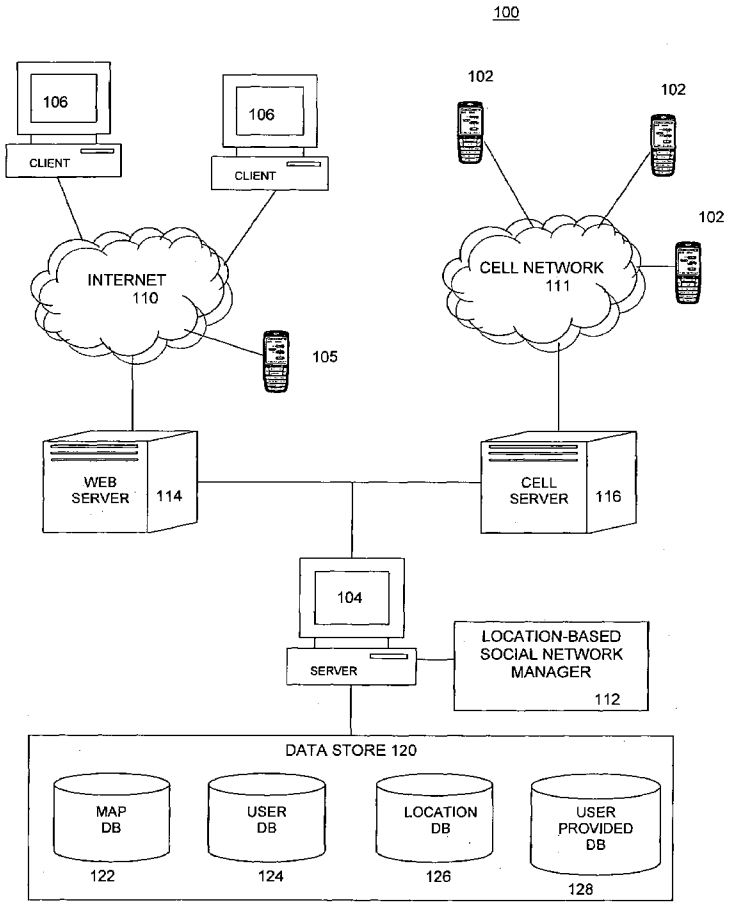
(57) **ABSTRACT**

Embodiments of an mobile dating system utilizing a location-based social network manager process are described. The social network manager process is executed on a server computer coupled to a plurality of mobile communication devices over a wireless network. Each mobile device is a location-aware mobile communication device. The process determines the geographic location of a mobile communication device operated by a user within an area, displays a map representation of the area around the mobile communication device on a graphical user interface of the mobile communication device, and superimposes on the map places of interest or the respective locations of one or more other users in the network. The user specifies a personal profile that includes information relating to the user that is pertinent to the user. The user also specifies preferences relevant to the type of person and/or relationship the user would like to find. The system includes a matching process that compares the dating information for the users within the system to determine whether any matches are within a preset radius of the user. When any matches are within the proximity of a user, the system sends an alert message to the user to allow the user to initiate communication with matches within the area. The system does not provide actual identifier information for the matched users, but instead provides means that facilitate communication between the user and the matched users. If both users agree, they can enable the display of their location information on the device display of the other user.



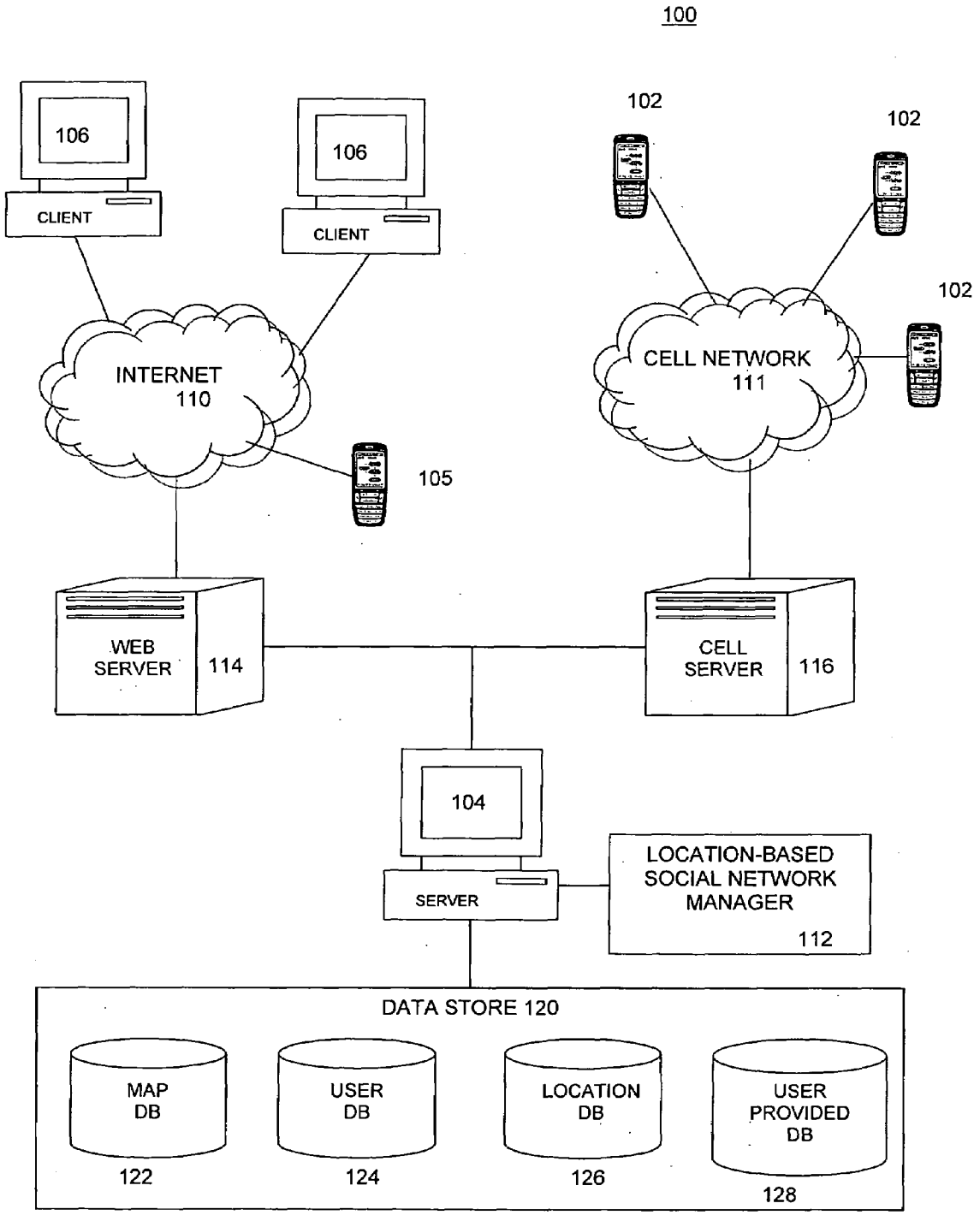

100
106
CLIENT
106
CLIENT
102
102
102
INTERNET
110
CELL NETWORK
111
105
WEB
SERVER
114
CELL
SERVER
116
104
SERVER
LOCATION-BASED
SOCIAL NETWORK
MANAGER
112
DATA STORE 120
MAP
DB
USER
DB
LOCATION
DB
USER
PROVIDED
DB
122
124
126
128

FIGURE 1

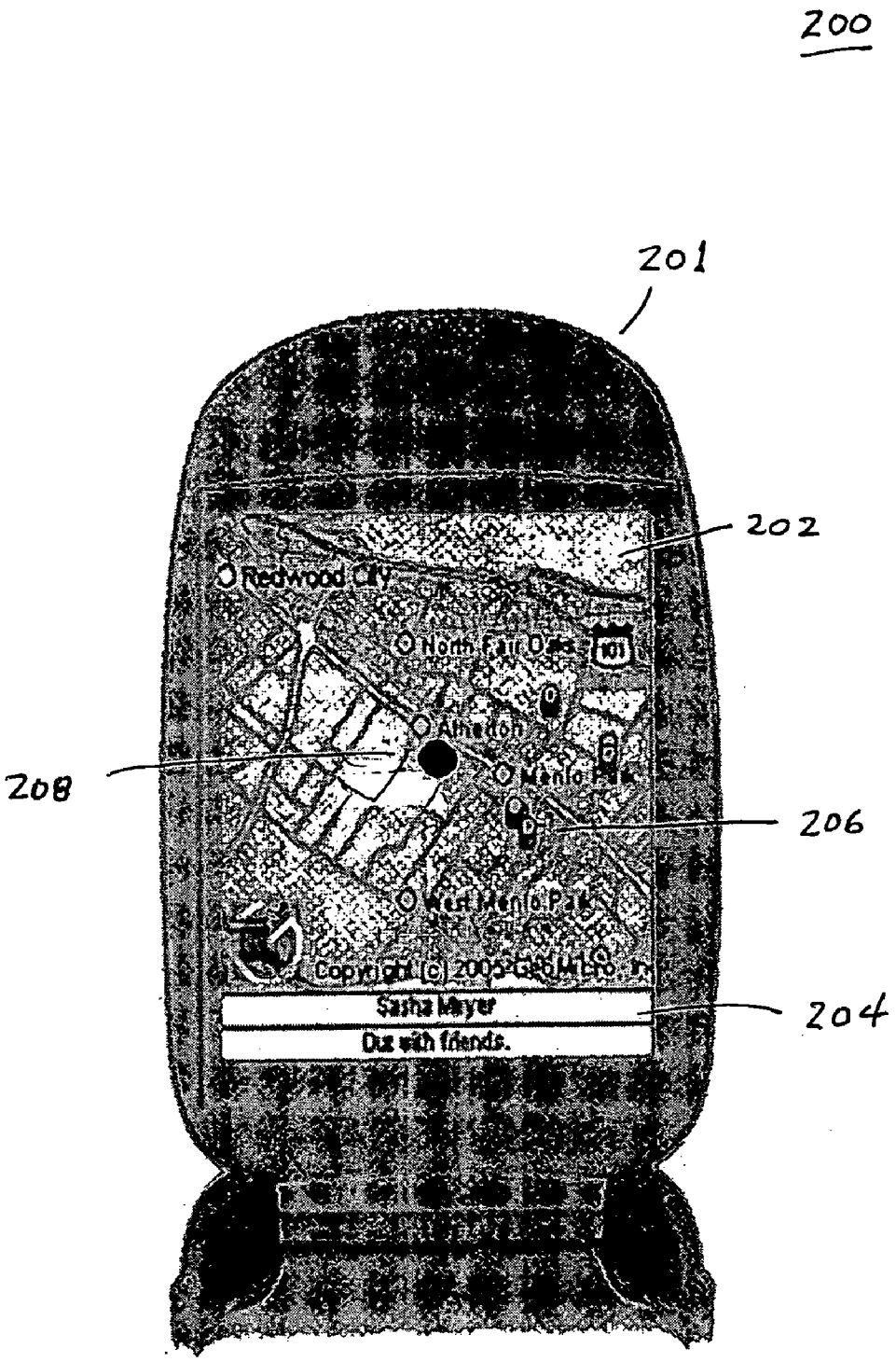

200
201
202
Redwood City
North Fair Oaks
Atherton
Menlo Park
West Menlo Park
Copyright (c) 2005 Geo Micro, Inc.
Sasha Meyer
Out with friends.
208
206
204

FIGURE 2A

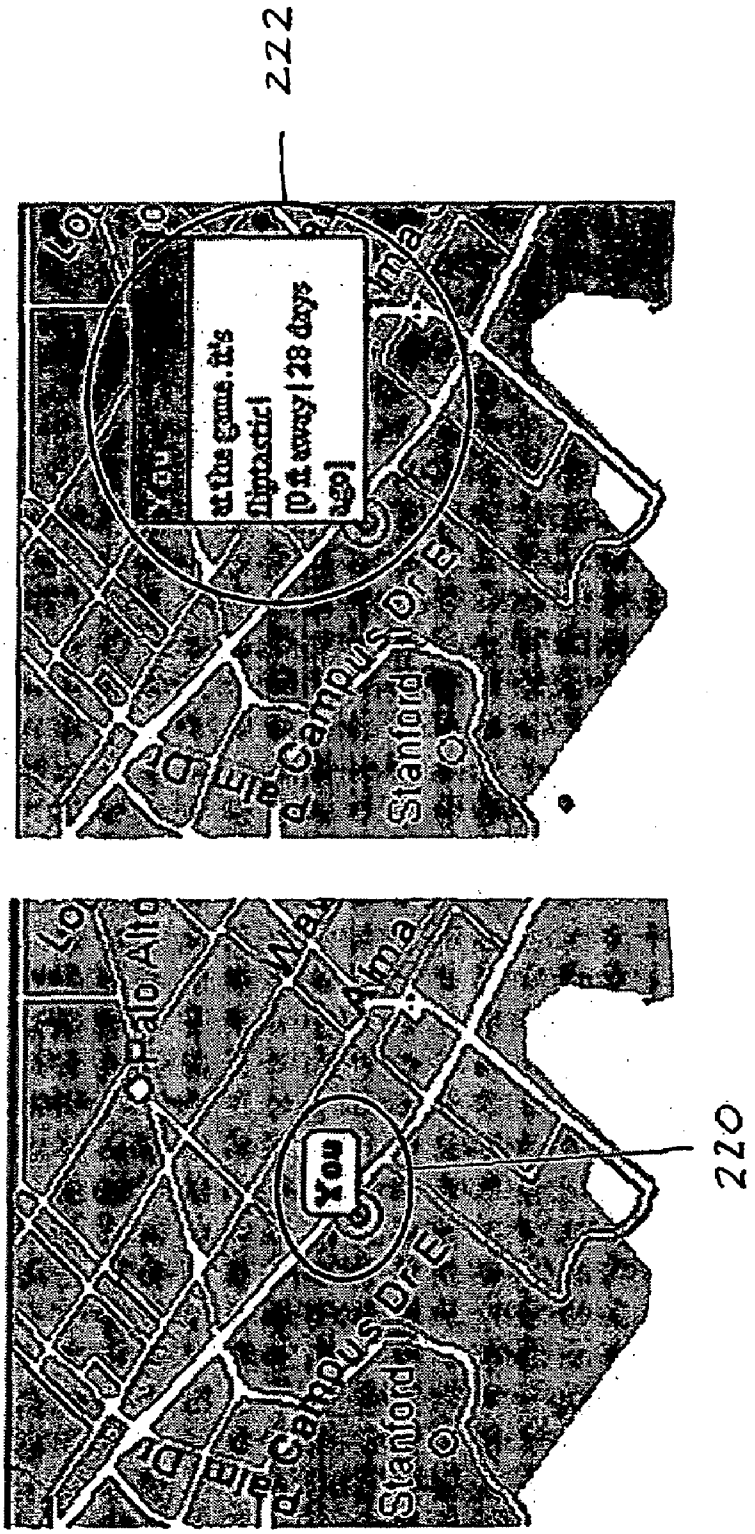

222
You
at the game, it's
flip tactic!
[0 ft away | 28 days
ago]
Stanford
Campus Dr E
220
You
Stanford
Campus Dr E

FIGURE 2B

300

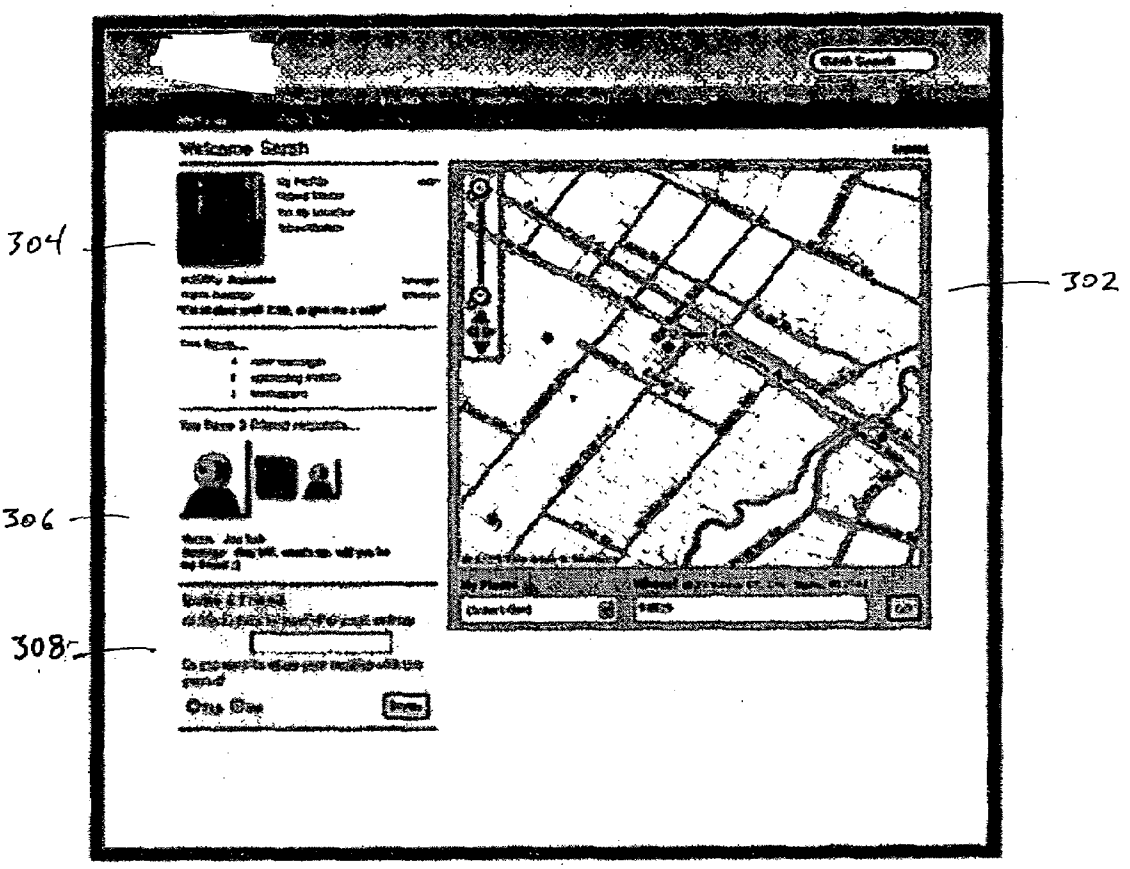


FIGURE 3

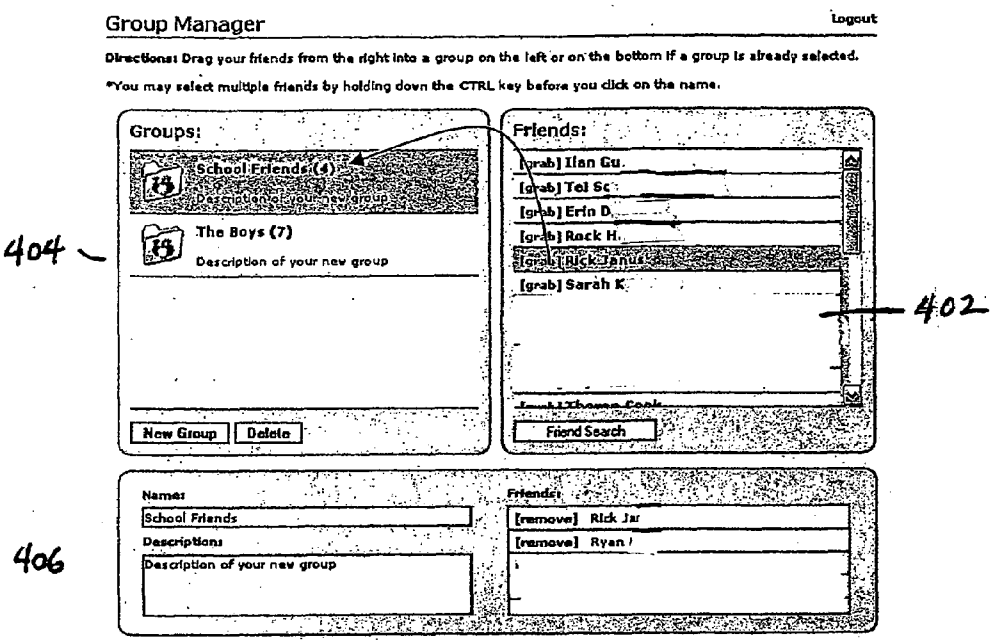


FIGURE 4A

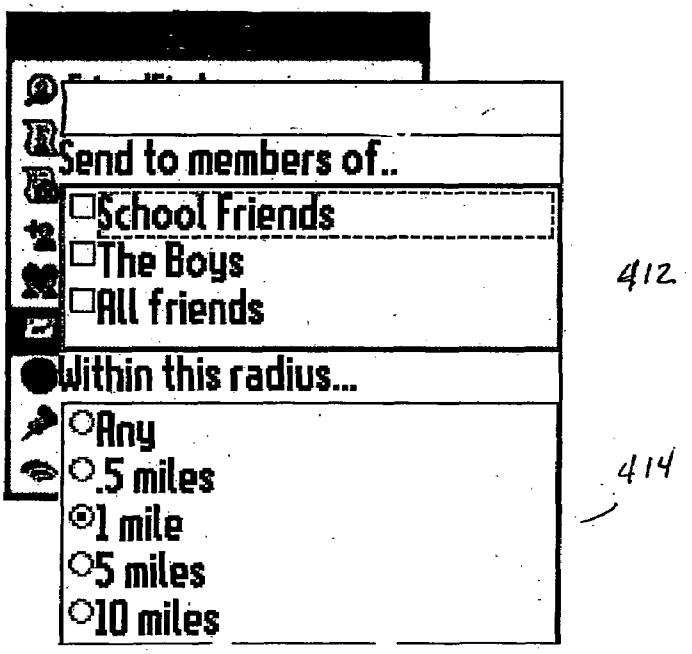


FIGURE 4B

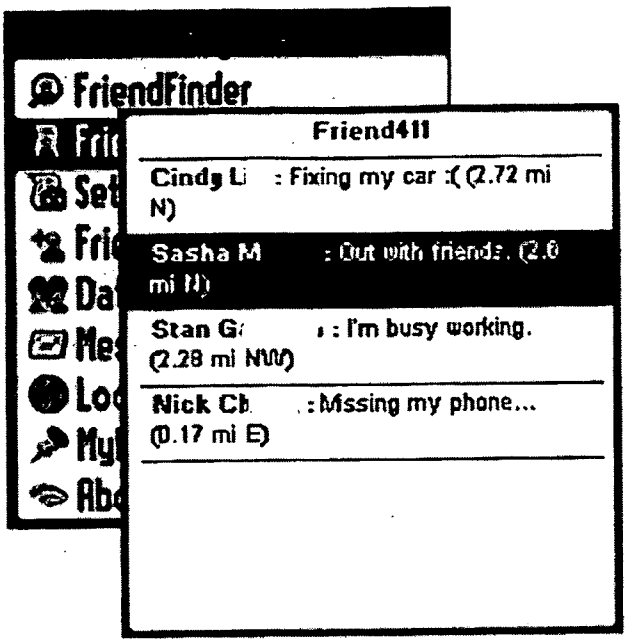


FIGURE 5A

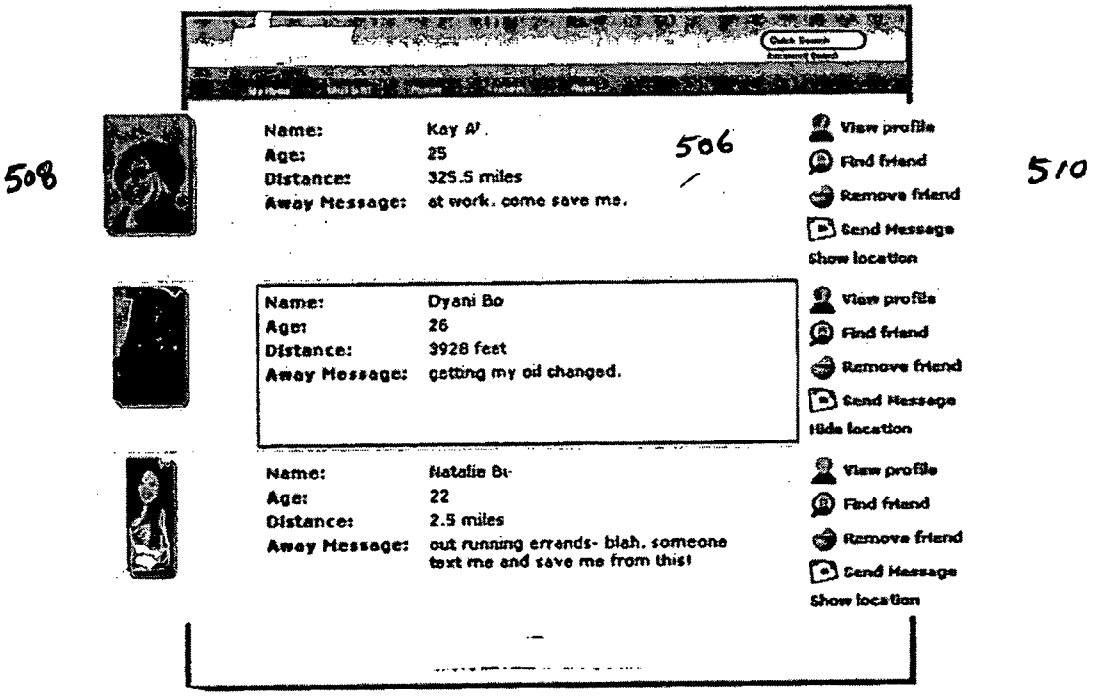


FIGURE 5B

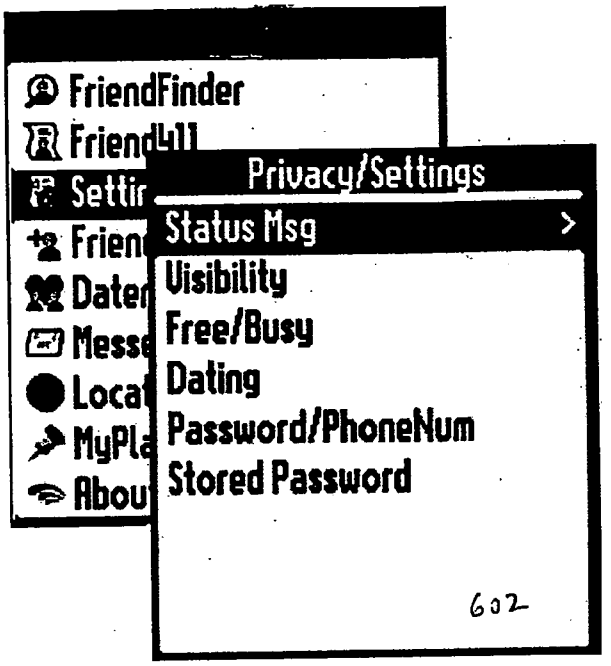


FIGURE 6A

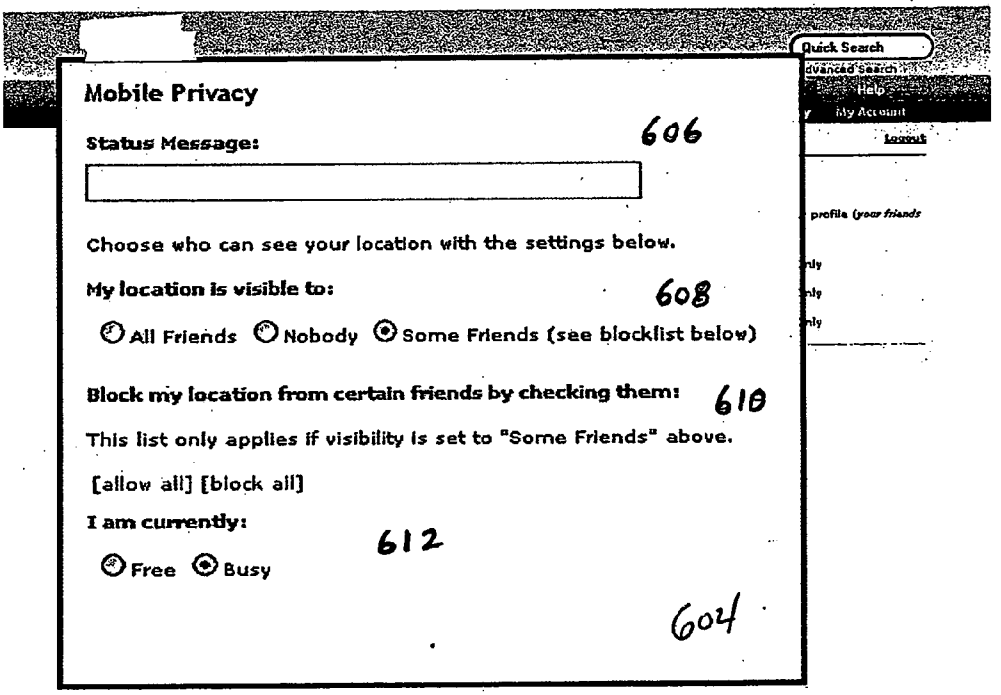


FIGURE 6B

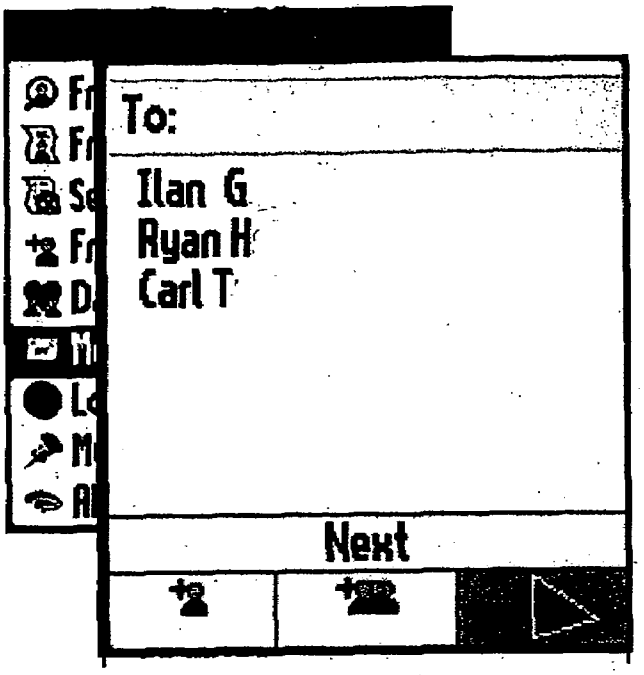


FIGURE 7A

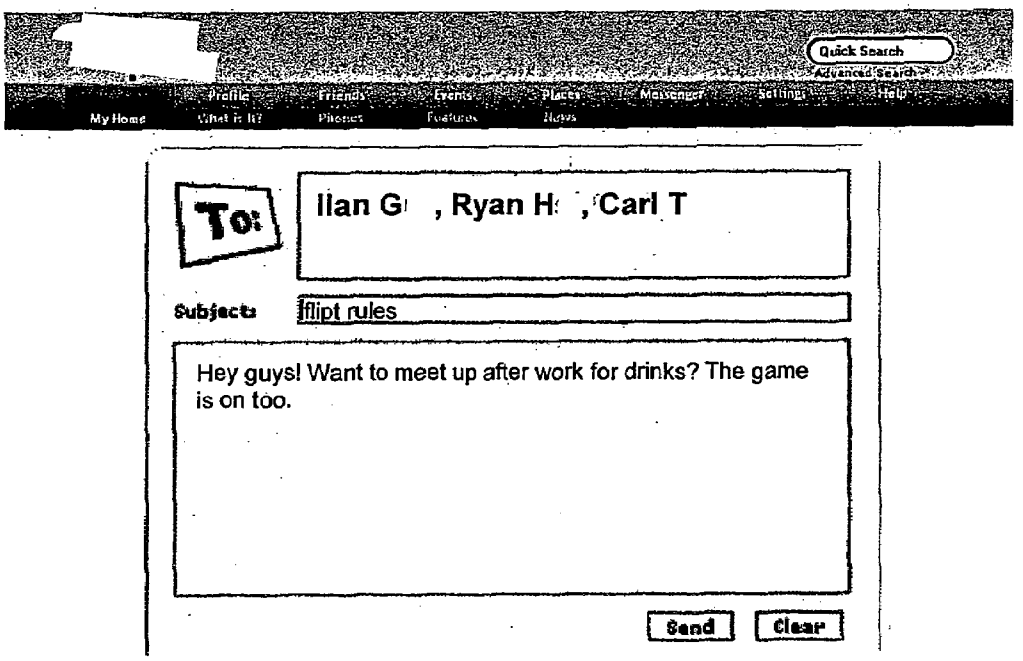


FIGURE 7B

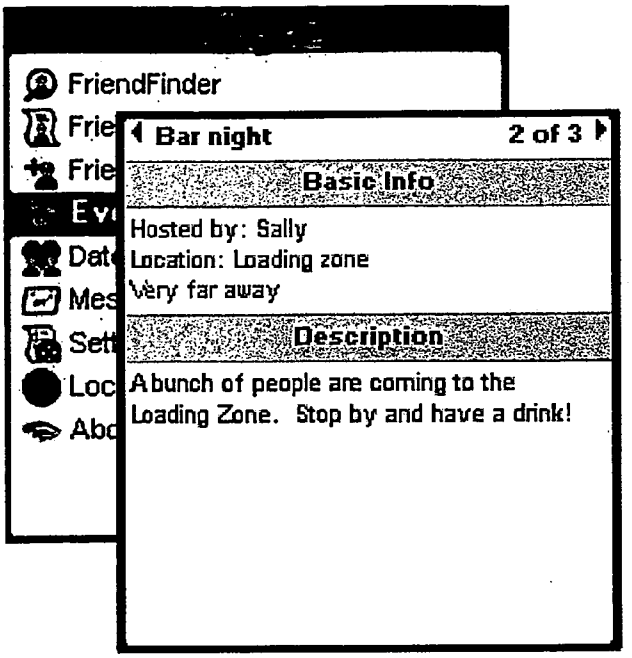


FIGURE 8A

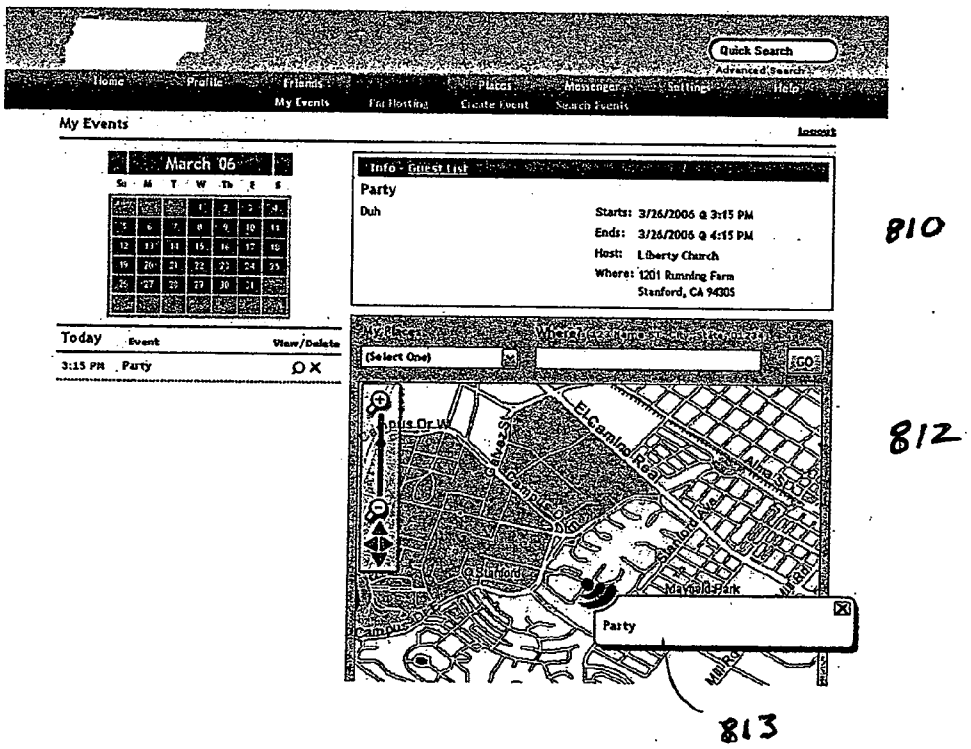


FIGURE 8B

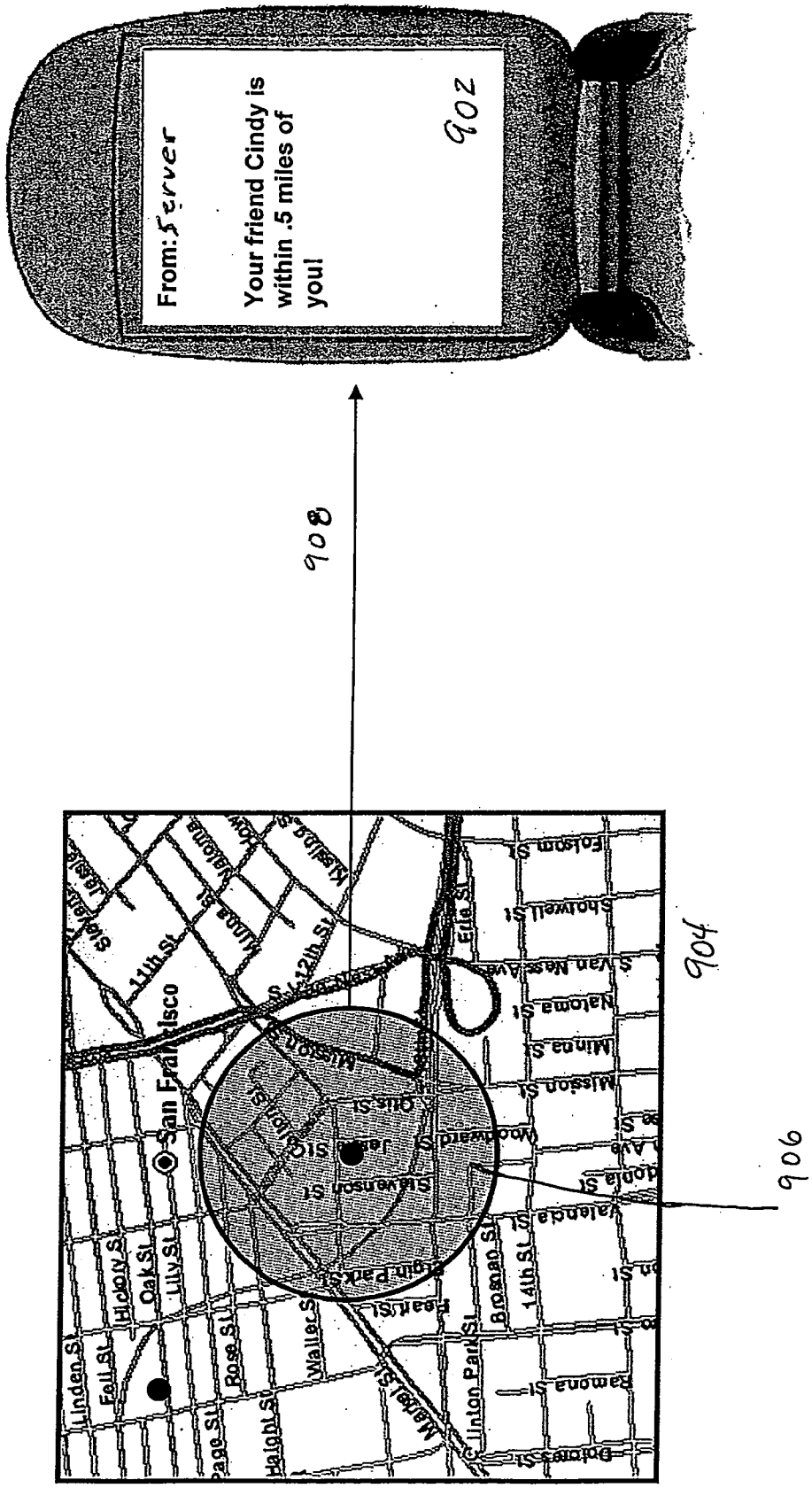

From: Server
Your friend Cindy is within .5 miles of you!
902
908
904
906
San Francisco
Linden St
Fell St
Hickory St
Oak St
Lily St
Page St
Rose St
Haight St
Waller St
Market St
Clinton Park St
Brosnan St
14th St
Ramona St
Dolores St
Valencia St
Elgin Park St
Stevenson St
Jessie St
Colton St
Otis St
Woodward St
Mission St
Minna St
Natoma St
S Van Ness Ave
Erie St
Shotwell St
Folsom St
11th St
12th St
Kissling St

FIGURE 9

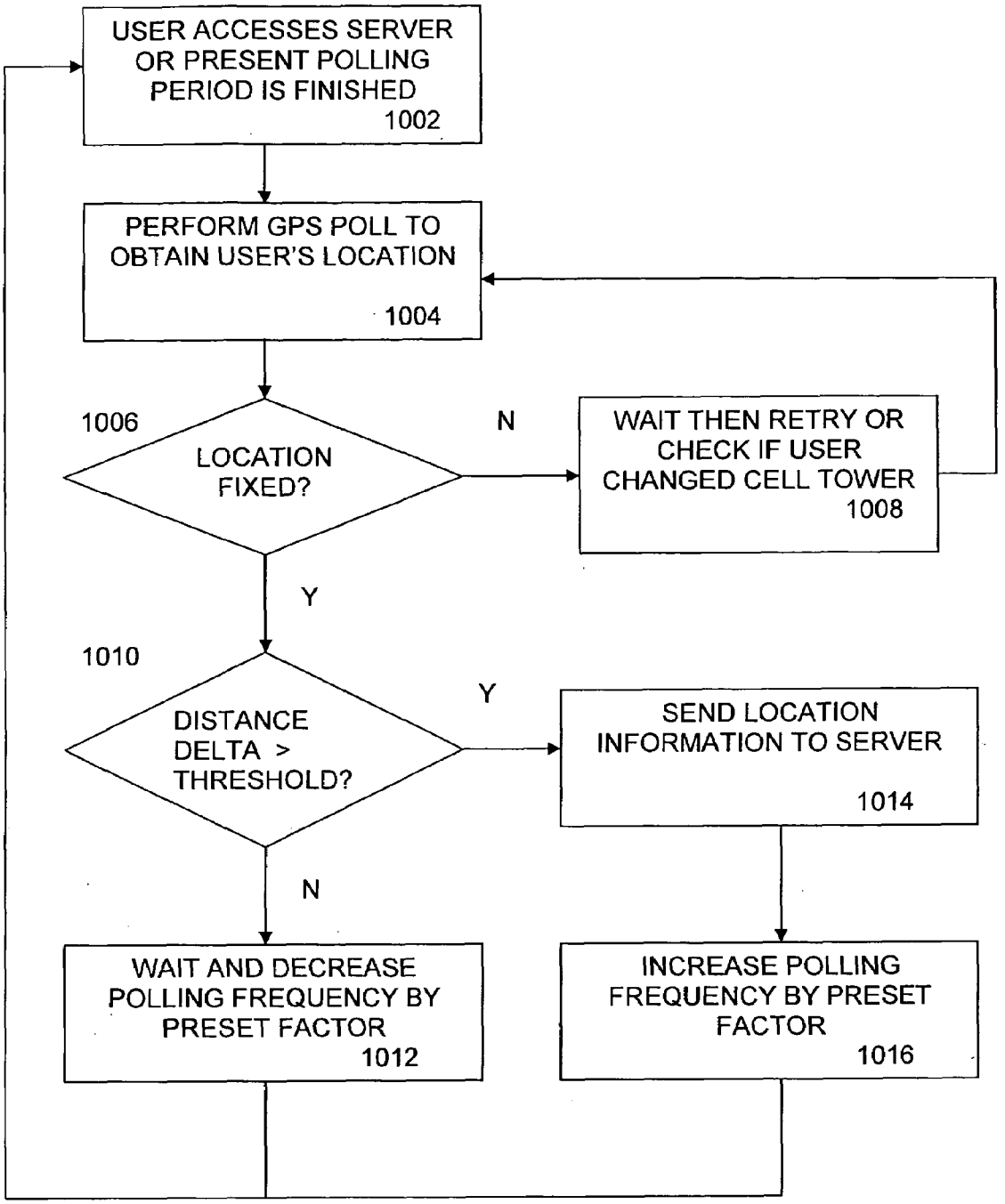

USER ACCESSES SERVER OR PRESENT POLLING PERIOD IS FINISHED
1002
PERFORM GPS POLL TO OBTAIN USER'S LOCATION
1004
1006
LOCATION FIXED?
N
WAIT THEN RETRY OR CHECK IF USER CHANGED CELL TOWER
1008
Y
1010
DISTANCE DELTA > THRESHOLD?
Y
SEND LOCATION INFORMATION TO SERVER
1014
N
WAIT AND DECREASE POLLING FREQUENCY BY PRESET FACTOR
1012
INCREASE POLLING FREQUENCY BY PRESET FACTOR
1016

FIGURE 10

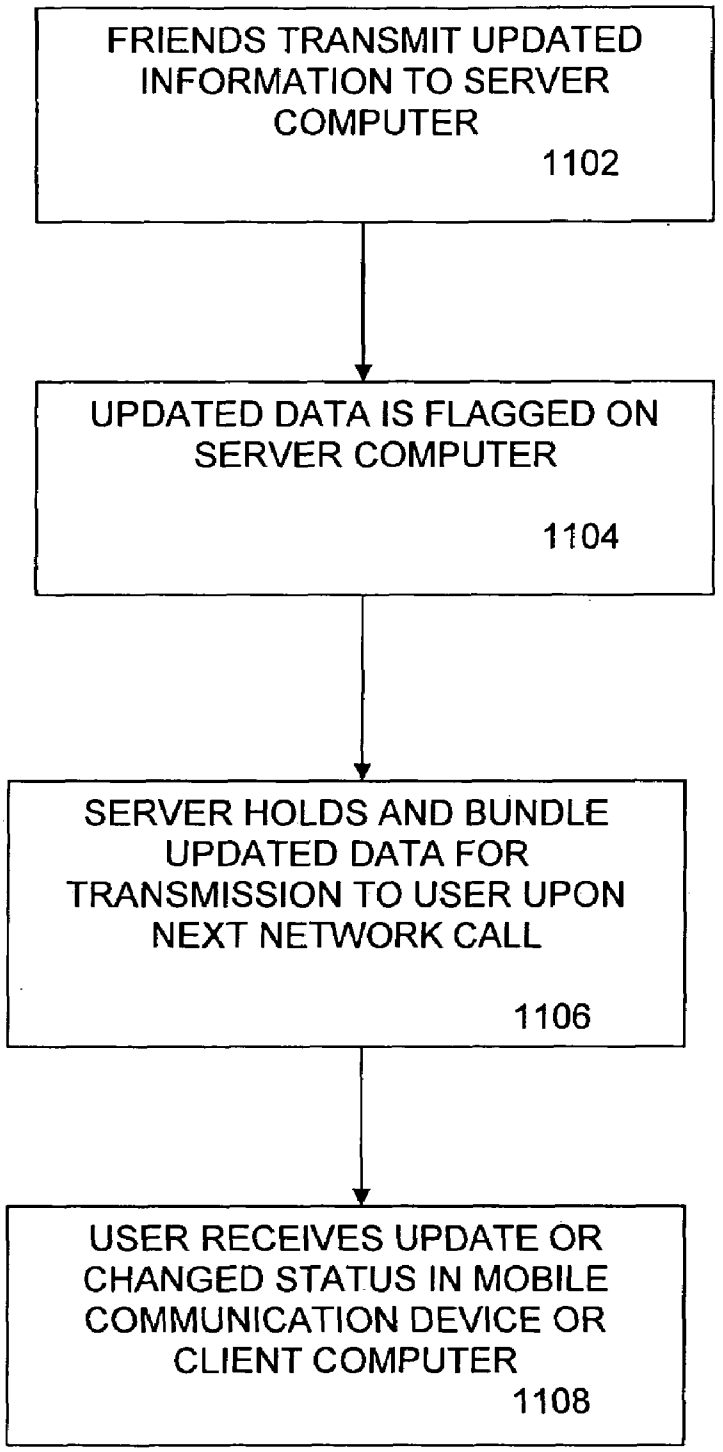
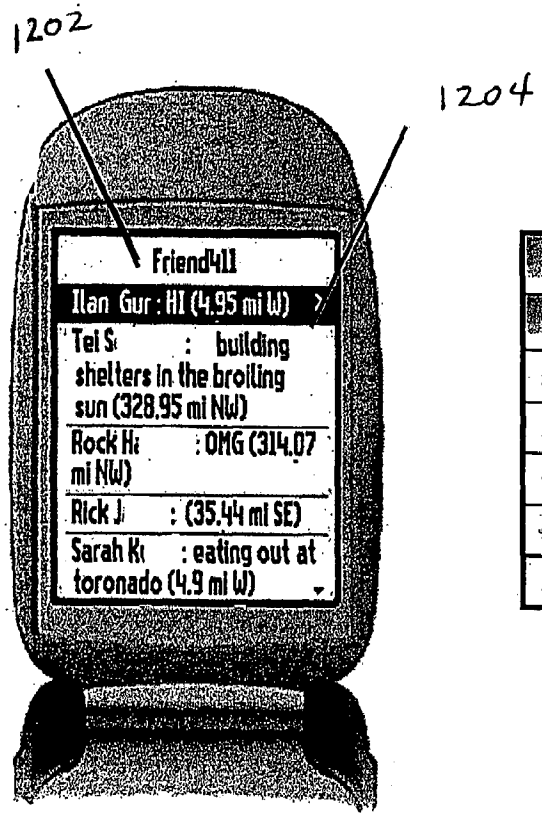

FRIENDS TRANSMIT UPDATED INFORMATION TO SERVER COMPUTER
1102
UPDATED DATA IS FLAGGED ON SERVER COMPUTER
1104
SERVER HOLDS AND BUNDLE UPDATED DATA FOR TRANSMISSION TO USER UPON NEXT NETWORK CALL
1106
USER RECEIVES UPDATE OR CHANGED STATUS IN MOBILE COMMUNICATION DEVICE OR CLIENT COMPUTER
1108

FIGURE 11



1206

friend411.table				
uid	name	dist	msg	flg
215	Illan G	4.95	HI	
216	Tei S	3.67	building shelters in the broiling sun	
217	Rock H	314.07	OMG	
218	Rick J	35.44		
219	Sarah K	2.5	Call me	

1208

FIGURE 12

USER TABLE 1302

UID	NAME	PHONE	LINKA
1	Illan G.	555-1452	A4321d74
2	Tei S.	555-0293	41chj892
3	Dan H.	555-2987	qr99e7b

LOCATION HISTORY TABLE 1304

LINKB	LOCATION.HISTORY
b56sha12	32.5465,14.144
4a8hop1	3243.54,324.3474
c48nfegp	143554,456477

FIGURE 13

1402

Home | Profile | Friends | Events | Places | Messaging | Settings | Help

View Profile | Edit Profile | Dating

1404

Edit Profile

Logout

1406

Personal | Contact | Education | Professional | Favorites | Questions | Dating | Picture

Name (first, middle, last): John Doe

Birthday: 1 / 15 / 1970 (mm/dd/yyyy)

Gender: (•) Male ( ) Female ( ) Unspecified

Interested In: ( ) Men (•) Women ( ) Both ( ) Unspecified

Looking for: [ ] Casual Dating [x] Relationship [ ] Casual Sex [ ] Soulmate [ ] Friendship

Relationship Status: ( ) In a relationship (•) Single ( ) In an open relationship ( ) Unspecified ( ) Married

Political views: ( ) Unspecified ( ) Liberal ( ) Very Conservative ( ) Very Liberal ( ) Conservative ( ) Libertarian (•) Moderate ( ) Green Party ( ) Disinterested ( ) Other

Interests:

Status Msg:

1400

FIGURE 14

Home | Profile | Friends | Events | Places | Messaging | Settings | Help

View Profile | Edit Profile | Dating

Edit Profile

Logout

Personal | Contact | Education | Professional | Favorites | Questions | Dating | Picture

My favorite...

Place For Breakfast
Place For Coffee
Place For Dancing
Place For Dinner
Place For Drinking
Place For Gambling
Place For Gaming
Place For Hanging out
Place For Lunch
Place For Outdoor activities
Place For Reading
Place For Relaxing
Place For Shopping
Place For Watching Sports
Type of Food

1502

Activities

1505

Books

Movies

Music

FIGURE 15

Home | Profile | Friends | Events | Places | Messaging | Settings | Help

View Profile | Edit Profile | Dating

Edit Profile

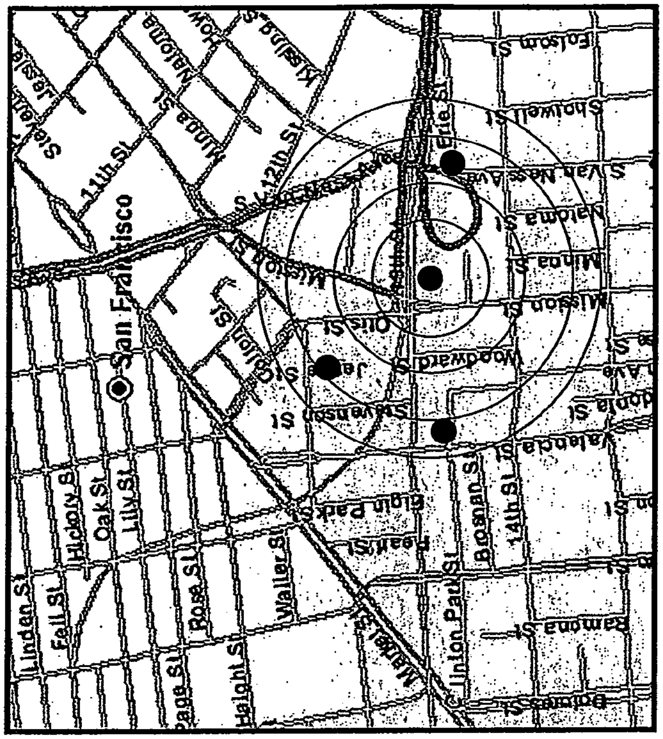
Logout

Personal Contact Education Professional Favorites Questions Dating Picture

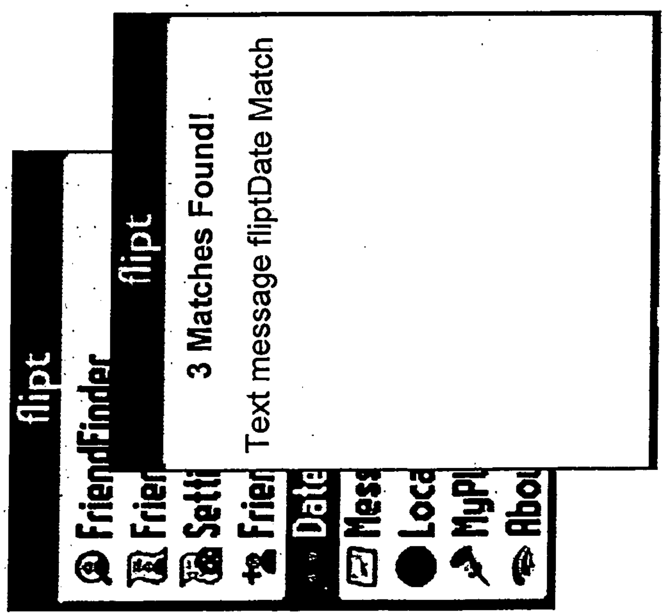
The **Dater** feature matches you with potential dates around you based on your dating profile. You will receive an alert on your phone when a match is nearby. This profile is only visible to potential dates or compatible people. **It is *not* viewable with your normal profile and is optional.** In other words, your friends will not see this profile.

Dating mode:	○ Off ◉ On	1602
Name:	John	
Age:	36	1604
Gender:	Male	
Status:	Single	
Interested In:	Women	
Looking For:	Relationship	
Age Range:	18 to 30	1606
About Me:	looking for a relationship	1608

FIGURE 16



1704



1702

FIGURE 17

MOBILE DATING SYSTEM INCORPORATING USER LOCATION INFORMATION

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The current application is related to U.S. patent application entitled "Displaying the Location of Individuals on an Interactive Map Display on a Mobile Communication Device" filed on Jun. 1, 2006, U.S. patent application entitled "Message Transmission System for Users of Location-Aware Mobile Communication Devices in a Local Area Network" filed on Jun. 1, 2006, and U.S. patent application entitled "Displaying and Tagging Places of Interest on Location-Aware Mobile Communication Devices in a Local Area Network" filed on Jun. 1, 2006.

FIELD

[0002] Embodiments of the invention relate generally to mobile communication networks, and more specifically, to an online dating system that uses the relative location information for users.

BACKGROUND

[0003] A variety of online dating services have been developed to take advantage of the extensive network capabilities of the Internet. Instead of providing localized exposure to the dating community through traditional means, such as newspapers or local bulletin boards, the Internet opens the pool of potential matches to a greater dating community and a much wider range of people. Many of these present online dating services provide fairly sophisticated matching algorithms to find compatible matches for people based on a potentially large number of characteristics associated with each user. Although these systems are often useful in finding suitable friends or dates for people, the process of coordinating the meeting of people through these systems is often quite cumbersome and must include special mechanisms to ensure the security and privacy of the users prior to their decision to meet. In this manner, present systems do not facilitate the spontaneous meeting of people, but instead require that both parties go through a potentially involved validation process or risk having their sensitive information simply disclosed to anyone who the system thinks may be compatible. Another disadvantage associated with present online dating services is that they do not account for the real-time location of the users. Although users can specify that they only wish to meet people who live in certain town or neighborhood, they do not actually take advantage of the instantaneous location of the people to facilitate the meeting of potentially matched people.

[0004] What is needed, therefore, is an online dating system that allows potential matched people to establish contact and meet whenever they are mutually available and interested in meeting and without requiring a complicated validation period.

[0005] What is further needed is an online dating system that notifies users of the presence of potential matches on the basis of the relative location of the people to facilitate communication or meeting when it is most convenient for both people.

SUMMARY OF THE INVENTION

[0006] Embodiments of an online dating system utilizing a location-based social network manager process are described. The social network manager process is executed on a server computer coupled to a plurality of mobile communication devices over a wireless network. Each mobile device is a location-aware mobile communication device. The process determines the geographic location of a mobile communication device operated by a user within an area, displays a map representation of the area around the mobile communication device on a graphical user interface of the mobile communication device, and superimposes on the map the respective locations of one or more other users of mobile communication devices coupled to the mobile communication device over the network. The user specifies a personal profile that includes information relating to the user that is pertinent to comparisons with other users in the system. The user also specifies preferences relevant to the type of person and/or relationship the user would like to find. The system includes a matching process that compares the dating information for the users within the system to determine whether any matches are within a preset radius of the user. When any matches are within the proximity of a user, the system sends an alert message to the user. The user then logs onto the server system to obtain background and contact information for the prospective match or matches, and can then initiate communication with matches within the area. The system does not provide actual identifier information for the matched users, but instead provides means that facilitate communication between the user and the matched users.

[0007] Other objects, features, and advantages of the embodiments described herein will be apparent from the accompanying drawings and the detailed description that follows below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Embodiments are illustrated by way of example and not limitation in the figures of the accompanying drawings, in which like references indicate similar elements and in which:

[0009] FIG. **1** is a block diagram of a mobile communication and computer network that implements embodiments of a location-based social network system.

[0010] FIG. **2**A illustrates an example of a map displayed on a mobile communication device, according to an embodiment.

[0011] FIG. **2**B illustrates the display of information details for users on a map, according to an embodiment.

[0012] FIG. **3** illustrates a web page that provides access to the database manager functions, under an embodiment.

[0013] FIG. **4**A illustrates an example of a database interface for storing and grouping friends on a client computer, under an embodiment.

[0014] FIG. **4**B illustrates an example of a database interface for storing and grouping friends for implementation on a mobile communication device, under an embodiment.

[0015] FIG. **5**A illustrates an example of a friend list displayed on a mobile communication device, according to an embodiment.

[0016] FIG. **5**B illustrates an example of a friend list displayed on a client computer, according to an embodiment.

[0017] FIG. **6**A illustrates an example of a privacy preference menu displayed on a mobile communication device, under an embodiment.

[0018] FIG. **6**B illustrates an example of a privacy preference menu displayed on a client computer, under an embodiment.

[0019] FIG. **7**A illustrates an example of a messaging function for implementation on a mobile communication device, according to an embodiment.

[0020] FIG. **7**B illustrates an example of a messaging function for implementation on a client computer, according to an embodiment.

[0021] FIG. **8**A illustrates an example of an event manager function for implementation on a mobile communication device, according to an embodiment.

[0022] FIG. **8**B illustrates an example of an event manager function for implementation on a client computer, according to an embodiment.

[0023] FIG. **9** illustrates an example of an alert function for the location-based social network manager process, under an embodiment.

[0024] FIG. **10** is a flowchart that illustrates GPS polling for a location determination module, according to an embodiment.

[0025] FIG. **11** is a flowchart that illustrates an example of sending updated information to a user's mobile device, under an embodiment.

[0026] FIG. **12** illustrates an example of a user update on a mobile communication device and a corresponding update table, under an embodiment.

[0027] FIG. **13** illustrates an example of a user table and an associated location history table, under an embodiment.

[0028] FIG. **14** illustrates an example of a dating profile page for an online dating system, under an embodiment.

[0029] FIG. **15** illustrates an example of a favorites profile page for an online dating system, under an embodiment.

[0030] FIG. **16** illustrates an example of an online dating system interface for the location-based social network manager process, under an embodiment.

[0031] FIG. **17** illustrates an example of an online dating system using user location, according to an embodiment.

DETAILED DESCRIPTION

[0032] Embodiments of an online dating system and service that uses a location-based social network system and mobile communication device that incorporates a real-time map display are described. In the following description, numerous specific details are introduced to provide a thorough understanding of, and enabling description for, embodiments of the system. One skilled in the relevant art, however, will recognize that these embodiments can be practiced without one or more of the specific details, or with other components, systems, and so on. In other instances, well-known structures or operations are not shown, or are not described in detail, to avoid obscuring aspects of the disclosed embodiments.

[0033] Embodiments are directed to a location-based social network system that enables the display of maps and real-time location information on mobile phones and similar communication devices. FIG. **1** illustrates a communication and computer network system **100** that implements one or more embodiments. In system **100**, a plurality of mobile communication devices, such as cell phones or similar devices **102** are coupled to a communication network, such as cell network **111**. The mobile communication devices (or "mobile devices") are each carried and operated by a user and communicate with one another using known communication methods such as wireless telephony, radio, satellite, cellular systems (e.g., GSM, CDMA, and so on), or other similar systems. For the embodiment exemplified by FIG. **1**, the mobile communication devices are cellular phones and the network coupling these devices is a cellular telephone network, although it should be noted that any other type of wireless network that supports mobile devices can also be used.

[0034] In one embodiment, a server computer **104** runs a location-based social network manager process **112**. This process controls various data objects relating to one or more social parameters or characteristics of the users of the mobile devices **102**. The users of the mobile devices form a group or number of subgroups of people who desire to interact with one another on a social level by communicating with one another, participating in activities, sharing information or experiences, or other types of social or professional interaction based on their location. Because the users of the mobile devices are inherently transitory, a fundamental data object associated with each of the users of the mobile devices is the location of each user within a particular region. Other parameters include the profile of each user, and the preferences of each user with respect to activities, people, privileges, and so on. Each user who desires to interact with other users in the system using this data utilizes the location-based social network manager process **112**. Through a subscription, or similar membership-type (free or fee-based) participation model, each user registers with the server computer **104** by providing certain information relating to the user. Each principle parameter or characteristic for each user is stored in one or more databases accessible to the server computer **104**. For the embodiment of FIG. **1**, the data objects are stored in a data store **120** and are organized in databases for user profiles **124**, user locations **126**, user provided data **128**, and map tiles **122**. The mobile network **111** supporting the mobile devices **102** are coupled to the server computer through an intermediate server computer, such as cell server **116**.

[0035] In one embodiment, each user of a mobile device may also operate or access the location-based social network manager process **112** through a client computer **106**, or any device that can access the Internet, such as a WAP (Wireless Application Protocol) device **105**. The client computer **106**, or similar device **105** (hereinafter also referred to as a "client computer"), facilitates the establishment and management of each user's account on the server computer by providing a comprehensive interface to the databases and processes provided on the server computer **104**. For the embodiment shown, the client computer interface supported by the server computer is a World-Wide Web (WWW) based interface through a web server **114** to the network **110** that supports the client computers **106**. Thus, for this embodiment, the web server **114** is a server or process that stores data in the form of web pages and transmits these pages as Hypertext Markup Language (HTML) files over the Internet **110** to the client computers **106**. For this embodiment, the client com-

puters typically run a web browser program to access the web pages served by the web server **114** and any available content provider or supplemental server that may also be coupled to the network. The client computers may access the Internet **110** through an Internet Service Provider (ISP). It should be noted that network **110** may be the Internet, a Wide Area Network (WAN), a Local Area Network (LAN), or any combination thereof.

[0036] As shown in FIG. **1**, aspects of the one or more embodiments described herein may be implemented on one or more computing devices executing software instructions. The server computer **104** is typically a server or workstation class computer, but can be any type of computing device with sufficient power and resources. The client computer **106** or **105** can be any type of personal computing devices, such as a workstation, personal computer, notebook computer, mobile communication device, game console, camera, personal digital assistant (PDA), or any device with an appropriate amount of processing capability. Likewise, each mobile device **102** can be a mobile computing device, such as a mobile phone, PDA, notebook computer, game console, or any similar class of mobile computing device with sufficient processing and communication capability to interact with other devices over network **111**.

[0037] As shown in FIG. **1**, server computer **104** runs a server-side location-based social network manager process **112**. The client computers **106** may run a client side version of this program, or they may access executable program components over the network **110**, such as through web browser. Data for any of the clients **106** or mobile devices **102** may be provided by a data store **120** that is closely or loosely coupled to any of the server **104** and/or each network **110** and **111**. A separate content provider computer may provide some of the data that is associated with the social network manager program **112**. Although data store **120** is shown coupled to the network server **104**, it should be noted that content data may be stored in or more data stores coupled to any of the computers of the network, such as a network client **106** or to devices within the network **110** itself.

[0038] In one embodiment, the location-based social network manager process **112** contains one or more program components that perform the tasks of displaying location and user profile information related to each mobile communication device that is part of the network, on each mobile device and client computer, and facilitating communication between devices based on the location information. The process also includes a database manager program that manages the different databases stored in data store **120**. It should be noted that the various databases **122** to **128** shown in data store **120** can be organized as separate databases, portions of a single database, or any other logical structure appropriate for storing the data.

[0039] As illustrated in FIG. **1**, data store **120** stores user information in user database **124**. This information relates to each user of a mobile device **102** and includes basic information, such as the user's name, identifier (nickname or "uid"), security check information (e.g., date of birth, mother's maiden name), and so on. Depending on the social network services provided by the system, this database can also store the user's social and consumer preference information, such as what type of people the user is interested in meeting or dating, what types of food or events the user prefers, and so on. The user provided database **128** stores graphic information related to each user, such as the user's picture, and any other associated images. These images can be displayed on the other user's mobile devices to provide a visual reference for each user. The user provided database can also store other data objects, such as video clips, audio clips, hypertext links, documents, or other data provided by or associated with the user. Location information for each user, such as location histories, frequently visited areas, and so on, is stored in the location database **126**. A map database **122** can also be included. This database provides the background maps that are displayed on each user's mobile device and correspond to an area or region around the user at the time the user invokes the process. In one embodiment, the map images comprise map tiles that are image files of maps with varying degrees of granularity. For example, a map tile of the United States may provide an image of the continental U.S. that can be zoomed to display a regional street level map for any area in the U.S. The maps may be stored locally within the data store **120** to be provided by the server **104** to the appropriate mobile device **102**, or they may be provided by a third party map provider. Other databases storing information relating to the user's of the system and the areas of their operation can also be included in data store **120**, such as an events database, a place of interest database, a store finder database, and the like.

Social Networking

[0040] In one embodiment, each user of a mobile device **102** maintains an account on the server computer **104** that is set up and maintained through a subscription or similar membership mechanism. This account allows each user to define their own profile and preference data and define the boundaries of interaction with the other users in the system. The server computer **104** may be a centralized server or cluster of server computers that maintains the processes and databases for a number of different users, or it may represent a distributed set of computers located in different geographic regions, each serving a different group of users.

[0041] The location-based social network manager allows each user to set up virtual networks that connect that user to other people, places, and events in a manner that adaptively utilizes the geographic location information for each of these items. The process **112** utilizes the user profile and preference information to allow the user to define networks of friends within the entire group of users and then locate these friends on maps that are displayed on the mobile device itself. Using the messaging and calendar functions of the mobile device, the user can then send and receive messages on the device from these friends, or find places of interest or events in the area.

[0042] In one embodiment, each mobile communication device runs local client versions of the map generator and database manager components. Such a component or components may be a thin-client program, such as a Java program running on a cell phone, for example. In one embodiment, each mobile communication device includes a circuit or component that determines the geographic location of the device relative to a standard set of coordinates. Such a location determination component can be a GPS module or assisted GPS (A-GPS) that provides the location of the mobile communication devices in terms of latitude/longitude coordinates, or a cell phone locator module that provides the location in terms of distance to the nearest fixed cell transmitter location or a group of transmitters, or other

similar location determination method. Such methods can include, but are not limited to: Time-of-Arrival (TOA), Time-Difference-of-Arrival (TDOA), a Wireless Fidelity (WiFi) network, mesh networks, and similar networks. The client side map generator displays a map of an area (provided by map database **122**) around the user on the display screen of the mobile communication device. Superimposed on this map is an indicator for the location of the mobile communication device. As the user moves, the position of his location on the displayed map is updated in real-time or near real-time. The map image information is configurable depending upon the location of the user, and can be provided by the server computer **104**, a separate map provider service, or it can be programmed into the mobile device itself.

[0043] In one embodiment, the client-side database manager component stores information relating to acquaintances, friends, family, or other contacts (hereinafter collectively referred to as "friends"), as well as other items of interest, such as places of interest or locations of events of interest. The map generator component can be configured to display the locations of such items of interest or of any friends that are within the region displayed on the map, and have mobile devices that are similarly capable of determining their own location. In this manner, the user of the mobile communication device can see his or her location relative to other friends or places of interest directly on map displayed on the mobile communication device. In general, the displayed map is a street level map to aid the navigation of the user within the region displayed by the map. The map can be scaled from any number of degrees of resolution, such as from country to state or city level down to block level, depending upon the configuration of the map generator component.

[0044] FIG. **2**A illustrates an example of a map displayed on a mobile communication device, according to an embodiment. As shown in FIG. **2**A, a mobile communication device, such as cellular phone **200** has a display screen **202**. The map generator displays a map on the display with certain icons superimposed thereon denoting the location of certain friends or places of interest to the user. For example, a large circular icon **208** may denote the location of the user of the mobile device, while smaller icons **206** or icons of a different shape and/or color may indicate the location of his or her friends. The display area can be divided into a number of different sub-display areas devoted to displaying information relating to the items displayed. Thus, as shown in FIG. **2**A, display area **204** displays certain information relating to the user, such as name, and status information. The status information includes both a status message, a user-programmed message that is displayed on the mobile devices of the other users, and an indication of availability of the user, such as "free" or "busy." A status flag can be defined to allow the user to specify whether he or she is busy or free to all or certain users. Other characteristics can also be defined and made available to other users in the network, such as event preferences, dating preferences, and so on.

[0045] Depending upon the constraints of the display of the mobile device, other items of interest, such as names and status of friends and/or places of interest or events can also be displayed or shown on the map. Different visual indicators or tiling techniques, or nested menu techniques can be used to provide access to the graphical information provided on the display. In one embodiment, the process can be configured to display the name, image, and any associated status information for a user when the icon associated with the user is selected on the display.

[0046] FIG. **2**B illustrates the display of information details for users on a map, according to an embodiment. Because of display space limitations that may be inherent in the mobile communication devices, and even the web pages, various different display configurations can be used to maximize the amount of information displayed at any one time. In one embodiment, pop-up screens are utilized to display the user information for a user whose location is displayed on a map. As shown in FIG. **2**B, the default display for a user **220** shows the name or user ID for each displayed user. In this example, the displayed icon is for the user of the mobile communication device himself, and so the user icon is labeled "You." Instead of displaying the user information is a portion of the display screen, the user information is provided in a pop-screen that is activated by a toggle switch or command. Thus, as shown in pop-up display **222**, information relating to the displayed user, such as an image, a profile, or a pre-stored message can be displayed without occupying too much display space. This window can be minimized using the appropriate reverse toggle sequence. In this manner, the amount of displayed information can be selected directly by the user.

[0047] In one embodiment, access to the account for a mobile device user is also provided through a web-based (or similar) interface from a client computer **106**. In general, client accounts and databases are created using the server computer. The client computer provides the means for the user to manage the databases used by the map generator, user database, user provided database, etc. and takes advantage of greater processing power typically not found in mobile devices, such as cell phones. One or more databases are created to store information related to the user's friends and other items of interest, such as events, locations, and the like. In one embodiment, the client computer **106** runs a web browser **114** to access web pages and resources available on server **104** and served by web server **114**. FIG. **3** illustrates a web page that provides access to the databases and social network manager system, under an embodiment. For the example web page illustrated in FIG. **3**, a first display region displays a map **302** showing the location of the user's mobile device. The user's profile is displayed in display area **304**. Other display areas can be configured to display other items of information depending upon the requirements of the user. For example, display area **306** can display messages or requests from friends, and display area **308** can provide an input area to send messages or requests to friends. The information shown on the web page **300** can be the same information displayed on the mobile device in a scaled up and rearranged format to take advantage of greater display space, or it may display information that is impractical to show and manage on the mobile device.

[0048] The database manager allows a user to create a database of friends, family, acquaintances, events, places of interest, favorite things, and any other items that have geographic and/or time context with respect to interests of the user. These data objects are stored in the user database **124** for each user. The information in this database can be organized in any number of ways. For friends, a grouping function allows the user to define specific sub-groups of friends to facilitate finding or messaging select people out of the total number of friends. Thus, friends and acquaintances can be grouped into different categories to allow easier

identification and contact with specific people. The client side module on the mobile device allows the user to access and modify these databases of people, events, and so on, on the mobile device. FIG. **4**A illustrates an example of a database interface for storing and grouping friends on a web page, and FIG. **4**B illustrates an example of a database interface for accessing the friends database on the mobile communication device. In one embodiment, the mobile communication device interface can also allow the user to manage the database by allowing storage and grouping of friends through a function similar to that illustrated in FIG. **4**A. As shown in FIG. **4**A, a list of contact names from the user database **124** is displayed in display area **402** and a set of groups is displayed in display area **404**. Through a drag and drop operation, or similar method, names can be added to one or more appropriate groups. Display area **406** allows a user to define or modify an existing group by naming, describing and modifying the composition of the group. A similar database access and grouping function is provided through the client side program for execution on the mobile communication device. The client side module allows the user to access the group database on the client computer, and add or modify the group definitions. As shown in FIG. **4**B, the defined groups are shown in display area **412**. In addition, a geographic descriptor is also provided to further define a characteristic associated with the group or any member within a group. For the embodiment illustrated in FIG. **4**B, display area **414** includes a descriptor that specifies the radius of the group members relative to the user's mobile communication device. In this manner, a message or alert can be sent not only to members of a particular group, but members who are within a certain proximity to the user. This additional degree of communication filtering takes advantage of the geographic location information determined by the network **100**. This location element related to the database of friends and groups can also be employed by the client computer **106** when it accesses the database on server **104**.

[0049] Information within the databases stored in data store **120** can be combined in any number of ways to provide the user with appropriate data relating to his or her friends. The location information relating to each friend can be used to provide a visual reference for the user on a map of the area, such as that illustrated in FIG. **2**A. In one embodiment, the location-based social network manager process includes a list utility that allows the user to pull and display various items of information relating to each of the friends within the system. Not only can location information be displayed on a map, but specific information can be displayed in a list format on the client computer or mobile device of the user. FIG. **5**A illustrates an example of a friend list displayed on a mobile communication device, and FIG. **5**B illustrates an example of a friend list displayed on a client computer, according to embodiments. As shown in FIG. **5**A, the friend list function starts a display window **502** on the display of the mobile device that lists friends whose information is accessible to the user. For each listed friend, various items of associated information can be displayed, such as the name, location (address, distance plus direction vector, latitude/longitude, time of last update or other), and any associated message or status information. The status information is programmed into the profile portion of the user database **124** for each friend and is pulled from that database, while the location information is pulled from the location database **126** for each friend and is pulled from that database. If the display of the mobile device accommodates the inclusion of the user's image, that can be pulled from the images within the user provided database **128** and also displayed on the mobile device. This is illustrated in the interface for the client computer shown in FIG. **5**B. In this embodiment, the same location and status information **506** is displayed for each friend along with an image **508** of that person. Also provided in the illustrated client computer interface is a menu area **510** that allows the user to perform certain tasks associated with the friends list, such as finding or removing friends, or sending messages to other users.

[0050] Because the location-based social network manager stores and provides access to sometimes sensitive personal information of a user to a network of people, certain security and privacy measures are included to allow the user to control who has access to this information. This can include the user's location information as well as profile and network interaction information. Some of the security functions include the ability to turn off the location sharing so that the location of the device is not broadcast and cannot be determined by other mobile device users. The location sharing on/off feature can be triggered through the website, a mobile application, a customer service call, or via an SMS message, or the like. If the mobile communication device is lost or otherwise compromised, the user can disable access to the service by expiring the session id and wipe all information from the device by means of an appropriate message or signal to the device.

[0051] Through a privacy preference utility, the user can define which characteristics the user can share with others within his or her social network, and set filters to limit access of certain information to only certain users. For example, the user can specify which user or group of users within the network can see the location of the user by defining a "blacklist" of users who are not allowed to see the location information.

[0052] FIG. **6**A illustrates an example of a privacy preference menu displayed on a mobile communication device, and FIG. **6**B illustrates an example of a privacy preference menu displayed on a client computer, according to embodiments. As shown in FIG. **6**B, the privacy and settings window **604** provides fields or commands that allow the user to specify a status message. This is the message that is displayed on the mobile devices of the other users, such as shown in FIG. **5**A, and the web pages of other users. A short message can be typed in depending upon the constraints of the system and can provide a small amount of useful information. The visibility setting **608** allows the user to set which friends are allowed to view the user's location information, and can be applied to all or no friends, or specific friends specified on the blocklist. Display area **610** allows the user to list the friends in the blocklist. Display area **612** illustrates a simple free/busy toggle that allows the user to set his or her status as free or busy. The busy setting may be configured to block the user's information from his or her friends until the user becomes free. The interface **604** illustrated in FIG. **6**A allows the user to set the privacy for the user's mobile device. Depending upon the constraints of the mobile device, the same or a subset of the privacy settings can also be displayed and accessed on the mobile device itself. The corresponding fields for the mobile device are illustrated in display window **602** of FIG. **6**A. Additional

fields may also be provided, such as a dating profile or preference, and a password specifier.

[0053] The mobile communication device can also be configured to provide other functions or utilities that facilitate user interaction with friends based on the location information displayed on the mobile communication device. For example, a messaging utility can be used to send and receive text or voice messages from a friend or groups of friends within a displayed area. In one embodiment, the location-based social network manager process **112** includes a messaging module that allows messages to be sent to friends on the device where they are most likely to see it. The messaging module utilizes the group module and the geographic location functionality of the mobile communication device. The message can be sent as a text message or instant message (IM) between mobile communication devices, or as a web message between client computers. In general, messages can be transmitted between any of the computers and devices illustrated in FIG. **1**, thus, messages can go from mobile to mobile, web to web or mobile to web.

[0054] FIG. **7**A illustrates an example of a messaging function for implementation on a mobile device, and FIG. **7**B illustrates an example of a messaging function for implementation on a client computer, according to embodiments. As shown in FIG. **7**B, the client computer based messaging function can be provided as a simple user interface with fields for the recipients, message subject, and message. An attachment utility can also be included to allow the transmission of attached data objects, such as documents, files, pictures, and the like. The mobile communication device version of the messaging function is typically a simple text based utility that displays the recipients and the text message to be sent, and if space is constrained, these display areas may be provided in successive screens of the device, as shown in FIG. **7**A. Message data can be sent via standard SMS protocol, data transfer, or any other suitable messaging protocol.

[0055] In one embodiment, the social network manager also includes an event manager module that allows a user to program places and/or events of interest. The event manager allows the user to create and manage various events using date and location information and send invitations or messages regarding the events to friends using the grouping function and messaging utilities of the system. Thus, the event manager module utilizes the group module and the geographic location functionality of the mobile communication device. Lists of public events can be provided by separate event servers accessible to the server, client computers or mobile devices of the system **100**, or they may be programmed into an event database stored in data store **120**. Typically private events are created and stored by each user, and each user may store events or other similar information in their own user provided database. Alternatively, events can be stored in one or more separate event databases (public and/or private events) within database store **120**. If permission is granted, the database functionality of the mobile devices allows a user to view events created by other users or those that are public. Public events are typically events that are provided by users or partners that provide event information.

[0056] FIG. **8**A illustrates an example of an event manager function for implementation on a mobile device, and FIG. **8**B illustrates an example of an event manager function for implementation on a client computer, according to embodiments. As shown in FIG. **8**B, a display area **810** displays a description of the event including the time and place of the event, as well as any other relevant information. The location of the event is shown as an icon **813** on a map displayed in display area **812**, and the date of the event can be shown on a calendar displayed in display area **814**. Similar information can be provided through the client side program for display through the mobile communication device, as shown in FIG. **8**A. Depending upon the constraints of the display the event information can be provided in a series of screens. Additionally, certain geographic parameters can also be provided, such as relative distance to the event based on the location of the mobile communication device as well as the location of the event on the map.

[0057] In one embodiment, the location-based social network manager includes a point of interest (POI) feature that allows users in the network to program and share private and public points of interest with one another. A database specifying places and/or events can be stored in data store **120**. This database can store different items of information relevant to a place of interest, such as, location, hours, products/services provided, and so on. This information can be provided to a user in a "pull" model, in which the user searches for the stored places of interest through the web page or mobile communication device. Alternatively, the information can be provided to the user in a "push" model in which the server sends relevant POI information to a user based on a user condition, such as if the user goes near a particular POI. The POI feature utilizes a reverse geocoding method in which the system determines the user's location, and correlates the location coordinates to entries in the POI database to determine which bar, restaurant, or other where they may be. This POI information can then be displayed on the user's friends mobile communication devices as the location of the user. This allows the system to automatically determine and display the location of a user and to share more descriptive and precise location information without requiring the user to manually type anything. For example, using the friend finding and messaging functions, a user can send a message to his or her friends simply saying that they are near the "ABC" bookstore instead of any address or other location information. In determining the location of the user, the server looks up the latitude/longitude information of the user, matches it to the corresponding POI, and sends the POI information to the other users in the network.

[0058] The storage of POI information in a database allows a user to search for and find places of interest almost automatically using the location finding capabilities of the mobile communication device. The user can specify a POI to be found, and the system will display the location of the POI relative to the user. The user can then bring up the relevant information relating to the POI, such as hours, prices, and so on. Places of interest can be private or public. Public places of interest are those that are defined or provided by the server or third party providers. Private places of interest are those that are defined by individual users. Depending upon the privilege settings, a user may be able to access his or her friends places of interest.

[0059] In one embodiment, the POI feature provides a tagging and feedback sharing mechanism that allows the user to tag a place and provide feedback. Tagging involves noting the location of a place or capturing an image of the place and downloading it to the server. User feedback can be provided as text messages or rankings using a user-defined

or pre-defined template that is stored in the user-provided database or separate POI database. This database can be made available to friends or other users of the network, depending upon the preferences set by the user. Various messages, such as reviews, advertisements, and the like can be associated with each POI and displayed upon selection of the POI by the user. The POI and messaging features also enable users to send itineraries of trips to groups of friends. This greatly facilitates the planning and communication of group trips.

[0060] In one embodiment, the location-based social network manager includes a review and recommendation function that allows each user to review and rank events or places of interest so that this information can be shared with the other users. When a user visits a tagged POI (or attends a tagged event), he or she can provide a numerical (keypad) ranking of 1-9 and/or write a short summary of the place. The server process can also be configured to automatically request or remind the user to provide a ranking or summary of the POI upon the user's next system login through the web site or the mobile communication device. For each POI, the server compiles the rankings and summary reports and makes these available to any user who desires to see them. The server process can also be configured to compile statistical profiles or qualitative profiles of different tagged places of interest once enough ranking or summary information is available.

[0061] The server process can also include a machine learning component that can provide personalized ranking and reviews for individual users based on the identity of the reviewers. This process includes a Bayesian trust network component that learns each user's trust levels with respect to the other user's. Each user may trust certain of their friends with respect to certain types of places of interest. In this case, the system will weight the ranking provided to the user based on the identity of the reviewer if the reviewer opinion is particularly trusted with respect to the tagged POI. In this manner, personalized and dynamic ranking and review profiles can be established for each POI based on the users and reviewers.

[0062] In one embodiment, an auto messaging mechanism sends an alert to a user based on the POI of another user. For this embodiment, when the user tags a particular POI, the server sends an alert to that user when a friend of the user gets within a certain distance of the POI. In this manner, the user can call, send a message, or arrange to meet with his or her friend at the POI, without needing to go through the trouble of pre-arranging a meeting. This facilitates spontaneous networking among users and their friends at particular places of interest. It should be noted that places of interest can be any type of location, such as retail establishment (store, restaurant, club, theater, gas station etc.), building (office, house, etc.), public resource (library, museum), street corner, object (e.g., ATM kiosk, post box), and the like Several interactive network features are facilitated through the use of the location determination and message capabilities of the mobile devices. For example, not only can friend locations be displayed on a user's mobile device, but an alert function can provide a graphic or audible alert to the user when a particular friend has entered a user determined area or region around the user. FIG. **9** illustrates an example of an alert function for the location-based social network manager process, under an embodiment. The user can specify a radius **906** around which he or she should be notified if a friend enters. The server computer then performs a periodic comparison of the user's location compared to that of his or her friends to determine if any of the user's friends are within this specified radius. The user location and radius are displayed on map **904**. When a friend enters this radius, as determined by the server computer, a message is sent from the server to the user over network link **908** and displayed on the user's mobile device **902**. The alert function can also be used to facilitate other interactive features, such as displaying or alerting the user to the location of places of interest in the displayed area or the time and location of events of interest when the user enters a particular area.

[0063] The user interface screens illustrated in FIGS. **2**A through **9** can be configured in any number of ways depending upon the constraints, requirements, and preferences of the system and system integrators. Various types of icons can be used to specify the identity and status of users and friends on the mobile devices and client computers of each user. For example, a portion of the mobile device display, such as the top of the menu may include one or more icons indicating whether the location of the device has been determined and whether or not the user is sharing his or her location information. The icons can be color or shape coded to define all of the different states available with regard to the user's location and status information. Likewise, the map display and icons for friends, places, events, and so on can be customized depending upon the needs and preferences of the user. Scrolling and scaling functions for control of the displays on both the mobile device and client computers can also be customized to utilize the input/output interfaces available on the different devices that can be used in conjunction with embodiments of the location-based social network manager process.

Location Determination

[0064] In one embodiment, each mobile communication device **102** includes a device location module that allows the mobile communication device to determine its own geographic location so that the location of the user operating the device can be displayed on a map on the device, as well as on the mobile devices and client computers of other users in the network. In one embodiment, the location information for mobile communication device is transmitted and stored in the server computer of the network. The location information for all of the users is then transmitted from the server to the mobile communication devices based on the filters and preferences established for each of the users.

[0065] For an embodiment in which the network **110** is a cellular phone network, and the mobile communication devices are cellular phones or cell based communication devices, the device location module is a cell ID positioning program that determines the location of the device relative to the nearest one or more cell transmitters to determine a location fix of the device. Depending upon the capabilities of the system, location accuracy can be provided on the order of one to two hundred meters to actual location. If accuracy is not sufficient, the user can be provided with their approximate location either through map or text display and then input their actual location using street address, point of interest, or latitude longitude information.

[0066] In one embodiment, the location determination module is a GPS (global positioning system) circuit that determines the location of the mobile communication device using GPS methodology. GPS circuits are capable of updat-

ing a device's location on a real or near real-time basis. However, such continuous updates can impose a great deal of processing and communications overhead on the device and the network. Moreover, for a device that is capable of displaying the location of any number of other users, such continuous update methods are highly impractical. If the actual location of every friend in a network were required to be determined every time the user brought up a map, the time and cost requirements would likely be excessive. For embodiments in which the communication network comprises a cellular phone network and the mobile devices are cell phones, the location determination module may be an assisted GPS or "A-GPS" module that uses an assistance server and cell tower that helps the GPS receiver in the phone perform tasks of range measurements and position solutions.

[0067] In general, the task of determining location in a mobile device and transmitting location information to a server can utilize a significant amount of power and processing resources, as well as generate a great deal of network traffic to the server. For systems with a large number of mobile devices, polling each device at a set frequency (e.g., every three minutes) could result in an overwhelming amount of network traffic. To minimize the power usage and network and processing overhead, an embodiment of the location determination module employs a GPS polling method that polls the device location of each mobile device in the system as infrequently as possible to thereby impose a minimum load on the carrier networks. The GPS polling method is an iterative polling method that employs a caching mechanism that updates a user's location based on known location information and user behavior. Instead of polling each mobile device in the network at a fixed frequency, the frequency of the location polls for each device depends on the movement and/or activity (interaction with the server) of the user. If the user is stationary and inactive the polling frequency is minimized to result in fewer GPS location polls. If a user is on the move and/or interacting with the server computer, the polling frequency is increased to result in more frequent GPS location polls. A difference value can be used to determine whether the updated location information is stored in the cache and/or transmitted to the server computer, thus adaptively utilizing system resources depending upon the amount of movement or activity of the user.

[0068] FIG. **10** is a flowchart that illustrates GPS polling for a location determination module, according to an embodiment. A location poll operation can be performed each time a user forces a location update from his mobile device, accesses the server computer from the mobile device, or at the end of a present polling period, **1002**. In the event of any of these occurrences, the user's present geographic location is determined, **1004**. In certain cases, a location fix might not be obtained, such as due to lack of signal, loss of device power, and so on. In step **1006** it is determined whether or not a location fix was obtained. If not, the device will wait (enter sleep mode) for a preset period of time, such as two minutes, and then retry the location fix. If a location fix is not obtained after a number (e.g., five) of tries, the system will determine whether or not the user has changed cell tower location, **1008**. If so, the system will send the cell tower location to the device and the location fix will be attempted again, otherwise, the device will longer period sleep mode before retrying.

[0069] If a location fix is obtained, a smart polling process is executed wherein the change in distance (distance delta) of the user from the present location and the previous location is used to set the polling frequency, and the location information is updated to the server computer. In step **1010** it is determined whether the new fixed location differs from the previous location by a threshold distance. If the distance delta is not greater than the threshold value, it is assumed that the user has not moved by an appreciable amount, and therefore no location update to the server computer is necessary. In this case, the location polling interval is increased by decreasing the GPS polling frequency by a preset factor. This results in fewer GPS location pulls for a relatively static user. The process then continues from step **1002** at the end of the first new polling period. If, in step **1010**, it is determined that the distance delta is greater than the threshold value, then it is assumed that the user has moved by an appreciable amount. In this case, the location information is transmitted to the server, **1014**. The polling frequency is also increased by a preset factor depending upon the current polling frequency. If the present polling frequency is slow, it can be increased to track the user. The process then continues from step **1002** to obtain a new fix at the end of the shorter period. If the user slows down or stops, the distance delta comparison step **1010** will cause the polling frequency to decrease in accordance with the reduced movement of the user.

[0070] The initial and modified location polling frequencies can be set to any value in accordance with the requirements and constraints of the server and mobile devices. For example, an initial polling interval could be set to 20 minutes, and the wait or sleep period could be set to anywhere between 15 seconds to 300 minutes. Likewise, the threshold distance represents the minimum distance that the user has traveled to require that the system update his or her location, and can vary from a few meters to a few kilometers, or more. The increase or decrease in the polling interval performed in steps **1012** and **1016** can vary from 100% of the present polling period up to a certain maximum number of minutes, such as between 80 minutes to 300 minutes, depending on certain factors such as time of day, system requirements, and so on.

[0071] The GPS polling method illustrated in FIG. **10** provides for efficient use of network and mobile device resources based on each user's activity and movement. The more active or more mobile a user is, the more frequent the GPS location determination operations occur. Likewise, if a user is stationary or less active, the GPS polling frequency is reduced. This results in less use of GPS services and network usage. Such polling can also be tailored depending on a user's sleep or general travel or commute patterns.

[0072] In one embodiment, the latest location information for a user is stored as a data entry on the mobile communication device and sent to the server for temporary or permanent storage. Each location entry is stored, at least temporarily, in the location database **126** on the server computer. The server computer can be configured to store only the latest location for the user, or all previous locations of the user in a location log. The location log entries include a time stamp based on the location poll time and the latitude/longitude (or other location indicator) at that time. To reduce memory usage successive unchanged location entries can be discarded so that only changes in location are stored in the location log. Security or privacy functions can

be implemented to block the access of location history information to anyone but the user himself.

Data Synchronization and Privacy

[0073] In one embodiment, the location-based social network manager process **112** includes an intelligent caching and synchronization function that caches critical data with normal updates to each mobile communication device in the network. Because a user can update their own data on either the mobile communication device or through the client computer, and other members can also impact a particular user's data, a synchronization function is necessary to ensure that the information available to the user is as up-to-date as possible while minimizing network traffic. Data between the user's mobile communication device and account data stored on the server and/or client may be out of sync because the user changed the data on the web site, but not the mobile device, a friendship request from another user was confirmed, or some other input from another user was input to the system. Each class of information to be synchronized is assigned a version number, which is maintained by both the server computer **104** and the respective mobile communication device **102**. Each time a mobile communication device makes a request to the server, its data packets are prepended with a set of synchronization bytes. The server checks all of these bytes. If the data is out of sync with data that is on the server, the updated information is prepended by the server computer for transmission back to the mobile communication device.

[0074] Certain important data is cached on the mobile communication device itself. This includes the status of a user's friends on the network and other similar data that is small in size and frequently accessed. The caching mechanism reduces the network traffic between the mobile communication device and the server computer, thereby increasing network efficiency, minimizing open sockets on the network, and providing a more fluid and immediate user experience through the mobile communication device. The synchronization function is used in conjunction with the mobile communication device cache to ensure data coherence between the user's mobile communication device and the server computer. FIG. **11** is a flowchart that illustrates an example of sending updated information to a user's mobile device, under an embodiment. In step **1102**, any friends with updated information transmit the new data to the server computer. The updated information can be generated by a new location fix or through a message transmitted over the system or a parameter change in the user's database. For example, an information update can be performed by the user inputting certain new or modified information directly into his or her mobile device, or automatically through a friend update, such as a status change caused by a friend changing location, sending a message, or changing the status availability flag. The updated information is transmitted from the mobile communication device to the server computer. On the server computer, the data is updated and flagged as updated data, step **1104**.

[0075] Although the server computer can be configured to transmit the updated information along to the user as soon as it is received, in a preferred embodiment, the updated information is sent only upon user activity to reduce network traffic and tailor data updates based on user demand. If a user is not active, it is assumed that the user does not necessarily need real time updates of changed friend information. Any user activity with the server computer can trigger an update, such as powering on the device, making a request for services, forcing a location fix, or a performing a refresh operation, and the like. Upon receiving a network call from the user, the server computer bundles all of the flagged and held updated data and transmits it to the user. Thus, in step **1108**, the user receives the updated data or changed status for his or her friend on the mobile device or client computer.

[0076] FIG. **12** illustrates an example of a user update on a mobile communication device and a corresponding update table, under an embodiment. The display area **1204** of mobile communication device **1202** displays the status information for a number of friends. This information is cached on the mobile device itself. The status information may be updated as a friend changes location or sends a message or signal that indicates a change in his or her status with respect to the user of the mobile communication device. The status information is stored in a corresponding friend information table **1206**, which is stored on the data store **120** of the server computer **104**. As shown in FIG. **12**, the information table **1206** stores the user ID, and name of the user's friends, as well as their distance to the user and any message text that was sent to the user from each friend. The table **1206** also includes a flag column **1208** to indicate the friends which have updated status information transmitted from the user's mobile communication device. For the example shown in FIG. **12**, message information for users **216** and **219** have been updated as indicated by the flag icon in column **1208**, as well as the graphical overwriting of the message in their respective message columns. This flagged data will be sent to the user upon his next interaction with the server computer.

[0077] To ensure protection of sensitive user information, such as profile data, credit and/or bank account information, location history, and any other user data objects that may be stored in the system, the social network manager employs certain privacy and security functions to limit access to user information to only the user and authorized members. In one embodiment, each user account is identified by a unique user ID and protected by an associated password known only to the user. User account information is typically stored on the server computer in the form of database tables, such as in user database **124**. Other information relating to the users are maintained in separate database tables on the server computer. These can include the location history, friends list, profile information, account information, or any other items of information managed by the system.

[0078] FIG. **13** illustrates an example of a user table and an associated location history table, under an embodiment. The user table **1302** contains the listing of the users with certain key information, such as name, user ID, and phone number, among other possible identification information. Certain databases within the system store sensitive user information, such location information and dating preferences, and the like. To ensure privacy and security, these tables are not explicitly associated with any particular user. This ensures that anyone gaining unauthorized access to the databases within the system will not be able to associate any particular sensitive information with the corresponding user. This correspondence is provided only by way of an encoded linkage structure. Thus, as illustrated in FIG. **13**, there is a code denoted "linkA" for each user. When a user is created within the system, the unique linkA code is generated for that user. It is a randomly generated alpha-numeric text

string that is unique to each user. The user also provides a password, which is not itself is not stored within the system, but is instead used to encode or link the table entries in the user table **1302** to other data objects in the user's database. Thus, in one embodiment, the linkA code is used by the system to link to other database tables holding sensitive or confidential information for the user within the system.

[0079] Table **1304** in FIG. **13** shows the relationship between a location history table for the users listed in the user table **1302**. In one embodiment, the linkA code is hashed with the user password to create a second reference code denoted "linkB" that associates the data within table **1302** with the respective user in table **1304**. Thus, as shown in FIG. **13**, the location history for each user is associated back to the user through the association created by linkA and linkB. No user name or identifier information is stored in the location history table, only the linkB parameter is used to associate entries in the second table with the user table. The user-specified password is not stored in any table, and if it is lost, the associated tables cannot be recovered. All secondary link codes are updated when a user changes his or her password.

[0080] Although FIG. **13** shows an example in which a location history table is associated with the user table, it should be noted that any other database table or data structure within the system can also be protected using the same type of linkage mechanism that utilizes a hash function based on the user password or similar protection string.

[0081] Because the social networking system can provide location and location history information for individual members of a network, certain privacy and security features are provided to allow a user to mask or hide a user's actual location information, or limit access to the user's location information. In one embodiment, a fuzzy location feature is provided. This function adds a random offset to the actual location of a user, and allows the user to share his general location information with other users but hide his exact location. For example, the offset could be one mile, thus the user's location would be offset by a mile when displayed on another user's mobile communication device. The offset value is used until the user moves out of the offset radius. The offset value is then reset and used until the user moves outside of the boundaries defined by the previous or new offset value. The user is randomly displayed in any location within the offset radius, and can be displayed as a large icon encompassing the entire fuzzy area or as a focused icon randomly placed within the radius. This prevents other users from being able to guess a user's location by selecting the location in the middle of several densities.

[0082] In certain deployments, such as those involving many mobile device users based around one or more server computers, the amount of data transmitted throughout the system can be very high. If many users constantly change location and/or message other users on a frequent basis and at approximately the same time, the network traffic could easily overwhelm the system causing lock-up conditions or drastic slowing of network traffic. In one embodiment, the location-based social network manager process employs a data compression mechanism to compress the location and message data to reduce the network traffic between the mobile devices and the server computer. The data compression mechanism, according to one embodiment recognizes frequently used patterns and assigns them a number between 0 and 255. These patterns can thus be represented in one-byte. A dictionary of the 256 most frequently used patterns is generated and stored on one or both of the server and client devices and shared between the client and server. In alternative embodiments, other known data compression methods can be used to compress the network traffic between the server computer and the client computers and mobile communication devices.

Revenue Model

[0083] In one embodiment, the location-based social network manager can incorporate or be used as a platform for a revenue-based social networking business system. One or more aspects of the process will involve fee-based services that generate income for any of the service providers and/or users. For example, a fee could be charged to each user every time a location fix is provided and displayed for the user's friends on his or her mobile communication device, or every time a message is sent or received from the user's friends. Revenue generating aspects can also be associated with the POI feature. For example, a fee could be charged to a user for accessing and displaying a POI on the mobile communication device. For commercial places of interest, a fee might be charged to the business for displaying the location on the user's mobile communication device. Likewise, fees could be charged for the transmission of advertising messages to the users in a network. Such ads could be associated directly with particular places of interest, or they could be streamed to the user's through an ad serving service, or the like. Various different revenue models can be implemented with the fee structure defined and controlled by the server computer administrator. Any revenue received through the use of service fees, message fees, advertising fees, subscription/membership fees, and the like can be retained by the system administrator or shared among the parties in a manner defined by the administrator.

[0084] In one embodiment, each user of a mobile communication device establishes an account with the server computer to set up the appropriate databases and establish communication with the server computer. This account mechanism establishes a membership system whereby users who can share their location information are all "members" of the network defined by the location-based social network process. In a typical deployment, the membership is free for the users. Alternatively, each user can be charged a periodic or one-time membership fee to use the social network process. In general, each member logs into the server computer individually to establish and manage their account. In one embodiment, the social network process includes a invitation mechanism that allows established users to invite non-members to the service. In this embodiment, the member user sends the phone number, e-mail address, or other contact information for the non-member to the server computer. The server computer then sends a client application (or applet) to the non-member user. The client application prompts the non-member to fill in certain fields to activate his or her new account. Upon providing the proper information, a new account is set up and this person is part of the network. The inviting member is automatically added as a friend in the new member's friends database.

Location-Based Online Dating System

[0085] In one embodiment, the location-based social network manager process includes an online dating component

that facilitates the matching of people within a network on the basis of dating or relationship preferences. When used in conjunction with a network of mobile communication devices, the online dating system can also be considered and referred to as a "mobile" dating system. The online dating component allows the user to create profile specific to dating parameters and preferences and view pictures and profiles of other users in the network who might be available for dating or similar relationship experiences. Using the location-based capabilities of the mobile communication devices and server computer described above, the social network manager system locates potentially compatible people in the same area of the user and facilitates communication among these users so that they can meet. In one embodiment, the mobile communication device of the user includes a separate dating mode that can be activated or de-activated.

[0086] The online dating component includes a separate profile page for each user who subscribes to the online dating service provided by the system. This profile page specifies certain characteristics specific to dating activities and preferences. FIG. **14** illustrates an example of a dating profile page for an online dating system, under an embodiment. As shown in the user interface page of FIG. **14**, a top menu bar **1402** provides access to the general functions provided by the location-based social network manager process, and a sub-menu bar **1404** provides access to the specific online dating functions. The "View" and "Edit" profile menu tabs of the sub-menu bar **1404** open the profile page **1400** illustrated in FIG. **14**. The profile page specifies various items of information relating to the user that might be relevant in determining compatibility with other users who might be interested in dating or establishing a relationship with the user. As shown in FIG. **14**, some of the profile items within the user's personal profile include his or her name, birthday, gender, present relationship status, political views, and the like. When utilizing the online dating system, each user can set up a specific user identifier that is different from the user's actual name or name used as part of the entire social network system. This user identifier basically comprises an alias (pseudonym) or dating name that provides a layer of anonymity and security for the user.

[0087] In the profile page, the user can also specify whether he or she is interested in meeting other men or women, and the type of relationship they are seeking. One or more text blocks can be provided to list particular interests that the user might want to broadcast. This allows the system to perform keyword searches on like fields of the other user's profile pages to determine compatibility on the basis of specific user interests. Other text blocks, such as the status message text block, can be provided to allow the user to type in a specific status message relating to dating availability and preferences.

[0088] Satisfactory matching of people in a dating or relationship context typically requires the identification of characteristics and match criteria across a broad set of data points. The online dating system of FIG. **14** also provides additional interface pages that allow the user to specify other personal characteristics. These are accessible through menu bar **1406**, and include, but are not limited to, contact information, educational background, professional and career background, favorite things/places/activities, answers to interesting or key questions, pictures of the user, and so on. Each of these additional profile information pages allows the user to input text or graphic information relating to the user, such as specifying which high school/university the user attended, what kind of job the user currently has or wants to have, and so on. Other pages provide specific fields that allow the system to determine matches based on similar input by other users.

[0089] FIG. **15** illustrates an example of a favorites profile page for an online dating system, under an embodiment. Any number of items **1502** can be provided for which the user can specify a particular favorite. As shown in FIG. **15**, these include favorite places to eat, dance, drink, hang out, shop, relax, and so on. Text fields **1505** can also be provided to allow the user to list specific favorites, such as books, movies, television shows, and so on. The listing illustrated in FIG. **15** is only one example of the many different types of favorite items that can be specified by a user. The fields of the favorites page allow the online dating service to compare and match entries with other users of the system in a one-to-one manner. Similarly, a "Questions" page can be provided to prompt the user to provide answers to several useful or provocative questions to allow other users to gain insight into the personality of the user.

[0090] In one embodiment, the online dating component can be activated and deactivated as a separate program within the location-based social network manager process. Likewise, a user's dating profile is defined and kept separate from his or her general profile, and is not accessible to other friends or users in the network, unless they are also engaged in the dating system and are compatible with the user. This allows the user to find other users strictly on the basis of dating preferences, rather than general friend or event preferences, and allows the user to specify and broadcast personal information to others for the purpose of entering specific types of relationships, rather than general activities. For this embodiment, the social network manager process provides a specific online dating interface page that allows the user to set the dating mode and specify search criteria for the system to perform searches. The dating service matches the user with potential dates in the vicinity of the user based on the users dating profile. In one embodiment, the user receives an alert on his or her mobile communication device when a match is detected to be nearby. The dating profile relating to the user can then be accessed by these potential dates so that they can decide whether or not they would like to meet the user.

[0091] FIG. **16** illustrates an example of an online dating system interface for the location-based social network manager process, under an embodiment. As shown in FIG. **16**, the online dating system page has a dating mode switch **1602** that activates or deactivates the online dating component. When activated, the user's mobile communication device is configured to receive signals relating to the proximity and availability of other possible matches and makes the user's dating profile and/or any dating related messages available to these matched users. The dating system page displays the basic information **1604** related to the user, which corresponds to the user profile information, such as that shown in FIG. **14**, as well as certain preference or criteria, such as age range **1606** of the person the user is seeking, as well as other similar information. This page also includes a text field **1608** that allows the user to enter additional information pertaining to the user that can be used by the matching process of the system or transmitted to potential matches detected by the system.

[0092] In one embodiment, the online dating component of the location-based social network manager process includes a matching program that receives the dating profile information for users and determines suitable matches based on certain correlation algorithms. The online dating component then determines the relative proximity of matched users to one another. In this manner, only potential matches who are within a certain distance to a user are registered as actual matches. The server computer **104** transmits an alert or similar notification to the user of any matches within this radius. FIG. **17** illustrates an example of an online dating system using user location, according to an embodiment. As illustrated in FIG. **17**, the system displays an alert window **1702** on the mobile communication device of the user notifying the user that one or more matches are within a certain distance of the user's present location. This location information can also be superimposed on a map **1704** displayed on the mobile communication device. The user can specify the maximum distance within which matches can be found, or a default value, such as half a mile, can be specified by the system.

[0093] In one embodiment, the online dating component includes a database lookup process and a comparison module that identifies eligible dating users within a group of users and then performs a matching function to find potential matches for each requesting user. The database lookup process first determines which users that are currently logged into the system or accessing the server have their dating mode option turned. It then looks through the personal profiles for each of these users and compares each relevant profile data object with corresponding fields in the other active dating users' preference pages. Secondary match criteria can be based on entries provided in the favorites page, questions page, and the like. Users who do not meet the criteria specified by the requesting user are filtered out by the system, and users who do meet the match criteria are either flagged or stored in a separate database. The location monitoring function of the location-based social network manager process tracks the relative location of the requesting user and any potential matched users. When any of these users enters the radius specified by the user or defined by the system, the process sends a notification to the user's mobile communication device, such as that illustrated in FIG. **17**.

[0094] To protect the security and privacy of each potential matching user, the online dating component does not allow precise location information of a potential match to be sent to other users of the system, and it does not allow his or her contact information to be sent to the searching user. The system can also block the display of the potential matches location on the mobile communication device of the searching user. In one embodiment, when a match is found, the user is alerted that a match within a certain distance is present. The alert message instructs the user to log into the server to obtain further background information about the potential match. This background information can include a picture and profile information about the potential match. The user can then initiate a communication through the server to the potential match. Thus, the system provides means to facilitate communication to the matched users, but does not provide identifying information directly to the user. For example, clicking on an icon of a matched user allows the user to send a message to the matched user to open a dialog or even set up a meeting. Thus, in one embodiment, if the user opts to contact any of the potential matches within this radius, he or she sends a notification message to the server. The server then routes this request to the appropriate matched user, who can then send a response back through the system to the requesting user. Transmission at this level is performed without either user knowing the actual identity of the other user. Once a dialog is established, the users can trade personal information and exact location, or they can continue to use the server as a communication proxy. For example, the server can be configured to send an anonymous call to both the searching user and the potential match. This call can alert the users to contact each other or set up a direct call between them when they log onto the server.

[0095] In general, once both users have established contact and mutually agreed to meet, they can enable the display of their location information on the device display of the other user to facilitate locating each other and setting up a meeting. For applications in which absolute location security is not required, the server can be configured to display a rough location for the potential match on the communication device of the searching user, or display a place of interest that is near both users so they can meet at a convenient location if both parties agree.

[0096] For the mobile dating embodiments, a revenue model may include charging a fee for the users to send anonymous messages to potential matches, or charging a membership surcharge to use the mobile dating service.

[0097] Embodiments of the location-based social network manager process described herein may be applied to various types of computer and mobile device networks utilizing communication over the Internet or similar distributed network protocols.

[0098] Aspects of the mobile communication device location display system described herein may be implemented as functionality programmed into any of a variety of circuitry, including programmable logic devices ("PLDs"), such as field programmable gate arrays ("FPGAs"), programmable array logic ("PAL") devices, electrically programmable logic and memory devices and standard cell-based devices, as well as application specific integrated circuits. Some other possibilities for implementing aspects of the process include: microcontrollers with memory (such as EEPROM), embedded microprocessors, firmware, software, etc. Furthermore, aspects of the described process may be embodied in microprocessors having software-based circuit emulation, discrete logic (sequential and combinatorial), custom devices, fuzzy (neural) logic, quantum devices, and hybrids of any of the above device types. The underlying device technologies may be provided in a variety of component types, e.g., metal-oxide semiconductor field-effect transistor ("MOSFET") technologies like complementary metal-oxide semiconductor ("CMOS"), bipolar technologies like emitter-coupled logic ("ECL"), polymer technologies (e.g., silicon-conjugated polymer and metal-conjugated polymer-metal structures), mixed analog and digital, and so on.

[0099] It should also be noted that the various functions disclosed herein may be described using any number of combinations of hardware, firmware, and/or as data and/or instructions embodied in various machine-readable or computer-readable media, in terms of their behavioral, register transfer, logic component, and/or other characteristics. Computer-readable media in which such formatted data and/or instructions may be embodied include, but are not limited to, non-volatile storage media in various forms (e.g.,

optical, magnetic or semiconductor storage media) and carrier waves that may be used to transfer such formatted data and/or instructions through wireless, optical, or wired signaling media or any combination thereof. Examples of transfers of such formatted data and/or instructions by carrier waves include, but are not limited to, transfers (uploads, downloads, e-mail, etc.) over the Internet and/or other computer networks via one or more data transfer protocols (e.g., HTTP, FTP, SMTP, and so on).

[0100] Unless the context clearly requires otherwise, throughout the description and the claims, the words "comprise," "comprising," and the like are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense; that is to say, in a sense of "including, but not limited to." Words using the singular or plural number also include the plural or singular number respectively. Additionally, the words "herein," "hereunder," "above," "below," and words of similar import refer to this application as a whole and not to any particular portions of this application. When the word "or" is used in reference to a list of two or more items, that word covers all of the following interpretations of the word: any of the items in the list, all of the items in the list and any combination of the items in the list.

[0101] The above description of illustrated embodiments of the location-based social network manager process is not intended to be exhaustive or to limit the embodiments to the precise form or instructions disclosed. While specific embodiments of, and examples for, the process and system are described herein for illustrative purposes, various equivalent modifications are possible within the scope of the described embodiments, as those skilled in the relevant art will recognize.

[0102] The elements and acts of the various embodiments described above can be combined to provide further embodiments. These and other changes can be made to the location-based social network manager process in light of the above detailed description.

[0103] In general, in any following claims, the terms used should not be construed to limit the described system to the specific embodiments disclosed in the specification and the claims, but should be construed to include all operations or processes that operate under the claims. Accordingly, the described system is not limited by the disclosure, but instead the scope of the recited method is to be determined entirely by the claims.

[0104] While certain aspects of the location-based social network manager process are presented below in certain claim forms, the inventor contemplates the various aspects of the methodology in any number of claim forms. For example, while only one aspect of the system is recited as embodied in machine-readable medium, other aspects may likewise be embodied in machine-readable medium. Accordingly, the inventor reserves the right to add additional claims after filing the application to pursue such additional claim forms for other aspects of the described systems and methods.

What is claimed is:

1. An online dating system comprising:

a plurality of location-aware mobile communication devices, each operated by a respective user of a plurality of users;

a server computer coupled to the plurality of location-aware mobile communication devices over one or more networks;

a data store coupled to the server computer and configured to store profile information and preference information for each user of the plurality of users;

a database comparison module executed within the server computer and configured to the compare the profile information for a requesting user with the preference information for each of the other users to determine a compatible match of the requesting user with any of the other users to identify compatible or incompatible matches; and

a location monitor module executed within the server computer and configured to monitor the location of the requesting user and any identified compatible matches.

2. The online dating system of claim **1** further comprising a notification module executed within the server computer and configured to notify the requesting user when any identified compatible match is within a predefined distance from the requesting user.

3. The online dating system of claim **2** further comprising a messaging module executed within the server computer and configured to facilitate the transmission of a message from the requesting user to an identified compatible match within the predefined radius, wherein the actual identity of the identified compatible match is hidden from the requesting user.

4. The online dating system of claim **1** wherein the messaging module is configured to send an anonymous message to both the requesting user and the identified compatible match and facilitate direct communication between the requesting user and the identified compatible match when both log onto the server computer.

5. The online dating system of claim **1** wherein the profile information includes at least one of the requesting user's identifier, birthday, relationship status, personality test results, and interests.

6. The online dating system of claim **4** wherein the preference information includes at least one of the requesting preferred gender, age, location, and interests of the compatible match.

7. The online dating system of claim **1** wherein the network comprises a cellular telephone network, and wherein each of the plurality of location-aware mobile communication devices comprises a location aware cellular telephone.

8. The online dating system of claim **7** wherein each location-aware mobile communication device includes a display and a graphical user interface component that displays a map of a region around the requesting user on the display and one or more icons representing the requesting user and any compatible match users superimposed on the map.

9. The online dating system of claim **8** the location of the location-aware mobile communication devices is updated on the map by updated location information determined by a location polling circuit, and wherein the polling period is dynamically determined in accordance with the frequency of movement of the device within the region around the requesting user.

10. A social network management system comprising:

means for determining the geographic location of a mobile communication device operated by a user within an area;

means for displaying a map representation of the area around the mobile communication device on a graphical user interface of the mobile communication device;

means for determining the compatibility of the user with one or more other users as potential friends based on the relative location of one or more other users within the area and profile and preference information provided by each of the user and the one or more other users; and

means for transmitting to the user, proxy identification information for a potential friend when the relative location is within a predefined radius.

11. The social network management system of claim **10** wherein the network comprises a cellular telephone network, and wherein the device and each of the one or more other mobile communication devices comprises a location aware cellular telephone.

12. The social network management system of claim **11** further comprising means for storing the profile and preference information for each user and the one or more other users.

13. The social network management system of claim **12** further comprising means for blocking the accessibility of the profile and preference information upon deselection of an option to make the information accessible to the other users.

14. The social network management system of claim **13** wherein the profile information includes at least one of a user's name, birthday, relationship status, interests, and one or more favorite items or activities.

15. The social network management system of claim **14** wherein the preference information includes at least one of the requesting preferred gender, age, and interests of the potential friend.

16. The social network management system of claim **10** further comprising means for superimposing on the map, a rough location estimate of the potential friend on the displayed map.

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