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(54) **PEOPLE MATCHING FOR SOCIAL ACTIVITIES ON AN ONLINE SOCIAL NETWORK**

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(57) **ABSTRACT**

In one embodiment, a method includes identifying multiple users of an online social network based on one or more affinity coefficients between the users and a geographical location associated with each of the users and sending a message corresponding to an activity recommendation to each of the users. The method also includes receiving one or more responses to the message from one or more users of the multiple users, respectively, where each response indicates whether the respective user is interested in the recommended activity. The method further includes, if the response from each of at least two of the users indicates an interest in the recommended activity, then sending a notification to each of the users who indicated an interest in the recommended activity identifying the other users who also indicated an interest in the recommended activity. Otherwise, the method includes deactivating the activity recommendation.

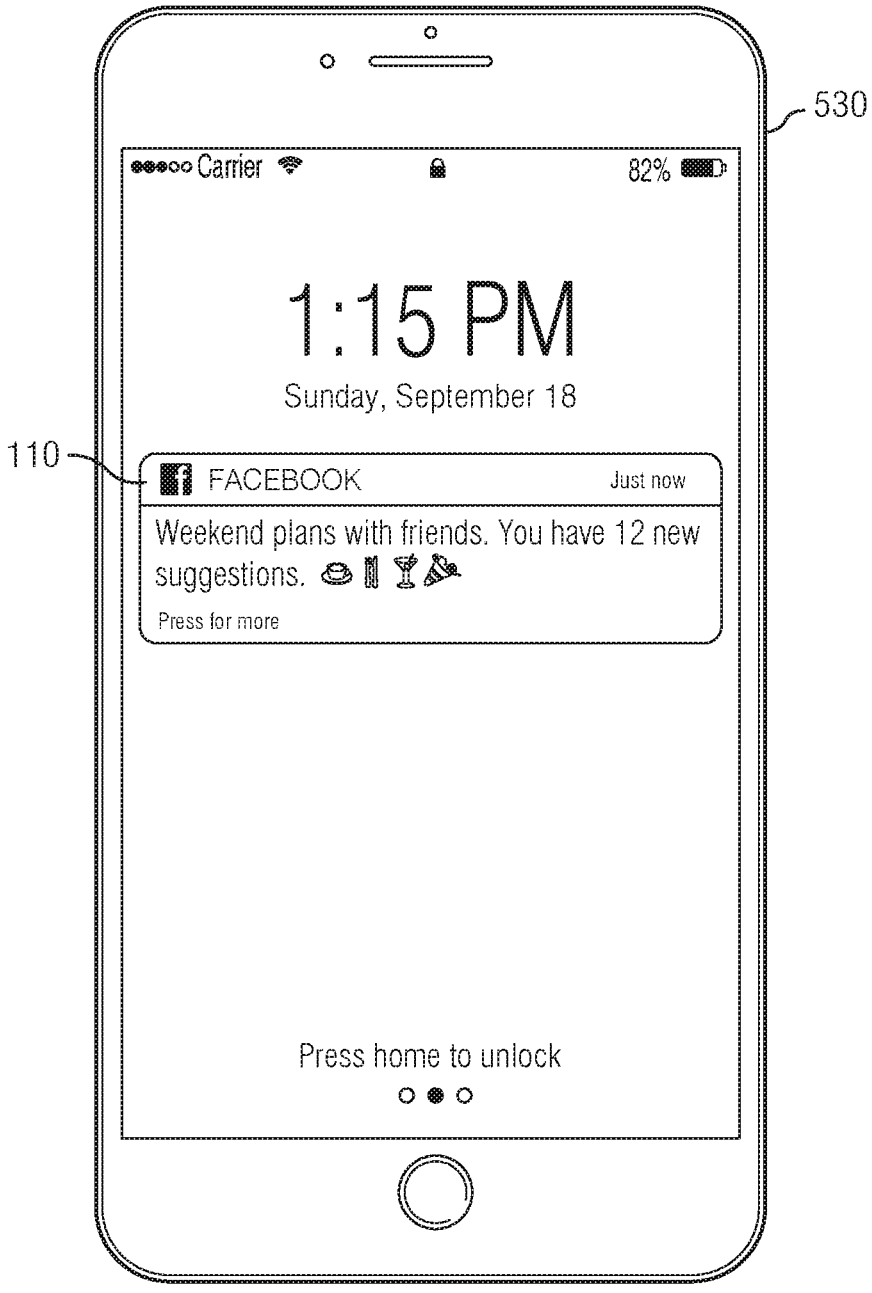
530
Carrier
82%
1:15 PM
Sunday, September 18
110
FACEBOOK
Just now
Weekend plans with friends. You have 12 new suggestions.
Press for more
Press home to unlock

FIG. 1

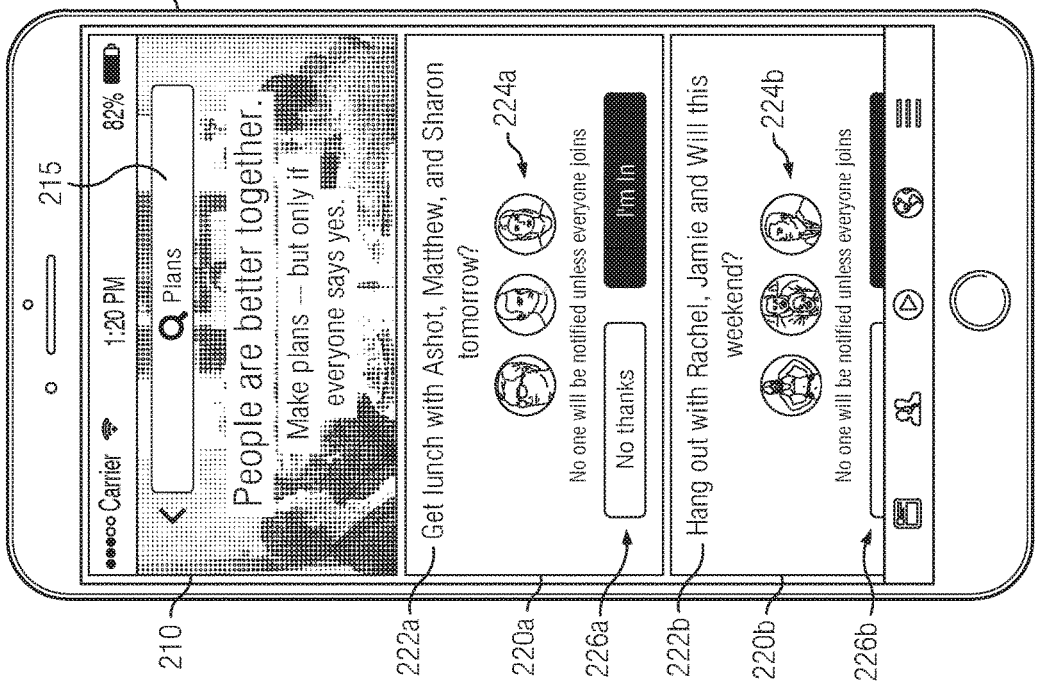
530
215
Carrier
1:20 PM
82%
Plans
People are better together.
Make plans – but only if everyone says yes.
210
Get lunch with Ashot, Matthew, and Sharon tomorrow?
224a
No one will be notified unless everyone joins
No thanks
I'm In
222a
220a
226a
Hang out with Rachel, Jamie and Will this weekend?
224b
No one will be notified unless everyone joins
222b
220b
226b

FIG. 2A

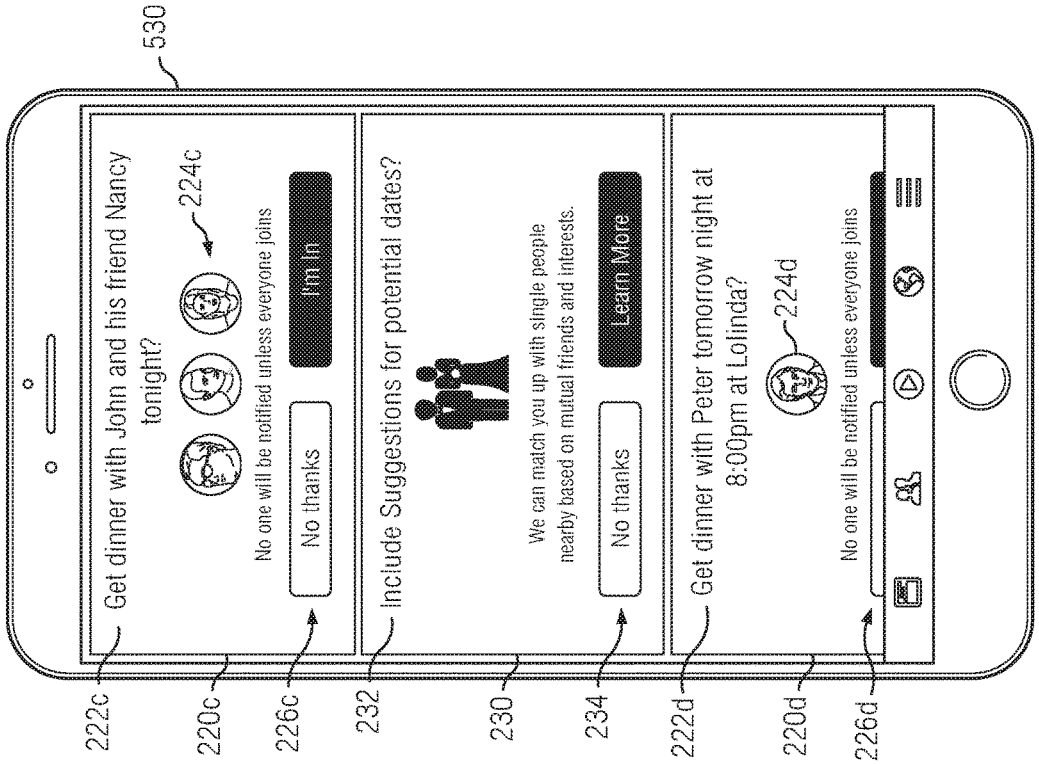
530
Get dinner with John and his friend Nancy tonight?
224c
No one will be notified unless everyone joins
No thanks
I'm In
222c
220c
226c
Include Suggestions for potential dates?
We can match you up with single people nearby based on mutual friends and interests.
No thanks
Learn More
232
230
234
Get dinner with Peter tomorrow night at 8:00pm at Lolinda?
224d
No one will be notified unless everyone joins
222d
220d
226d

FIG. 2B

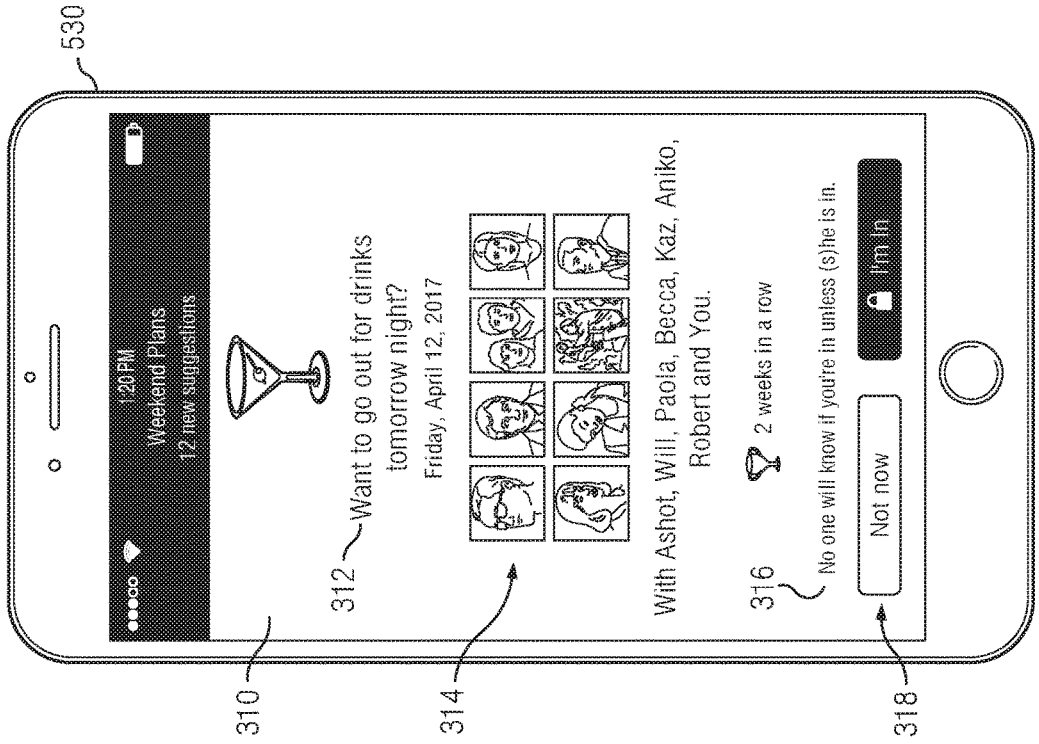
530
1:20 PM
Weekend Plans
12 new suggestions
312
Want to go out for drinks tomorrow night?
Friday, April 12, 2017
314
With Ashot, Will, Paola, Becca, Kaz, Aniko, Robert and You.
316
2 weeks in a row
No one will know if you're in unless (s)he is in.
318
Not now
I'm In
310

FIG. 3A

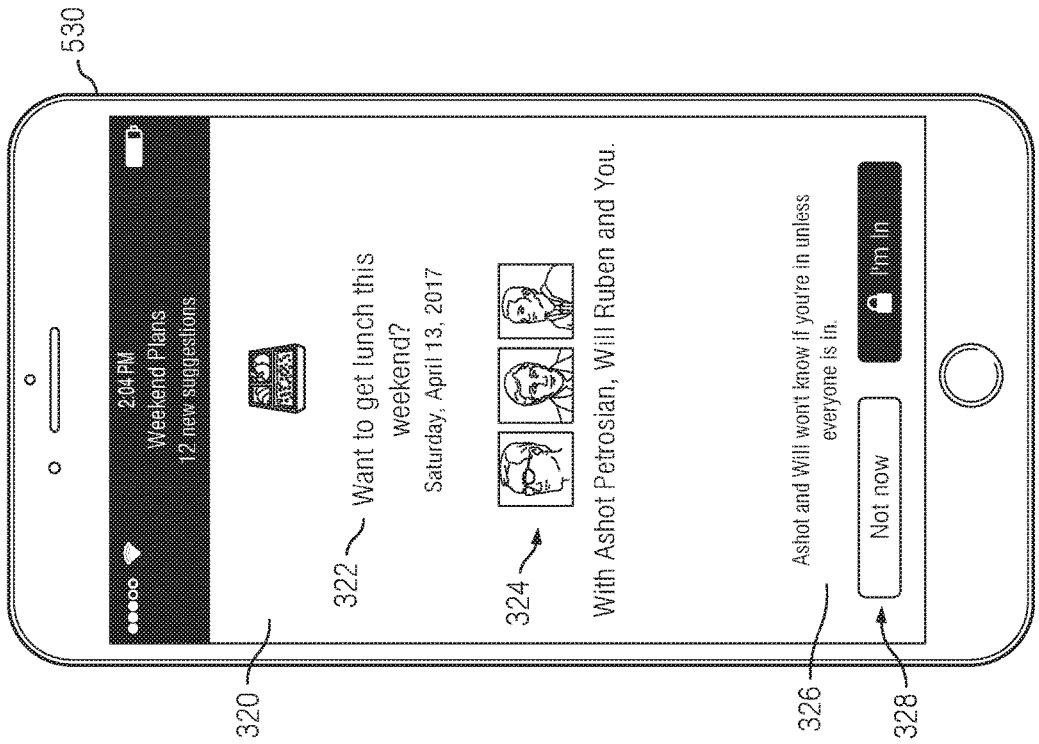
530
2:04 PM
Weekend Plans
12 new suggestions
322
Want to get lunch this weekend?
Saturday, April 13, 2017
324
With Ashot Petrosian, Will Ruben and You.
326
Ashot and Will won't know if you're in unless everyone is in.
328
Not now
I'm In
320

FIG. 3B

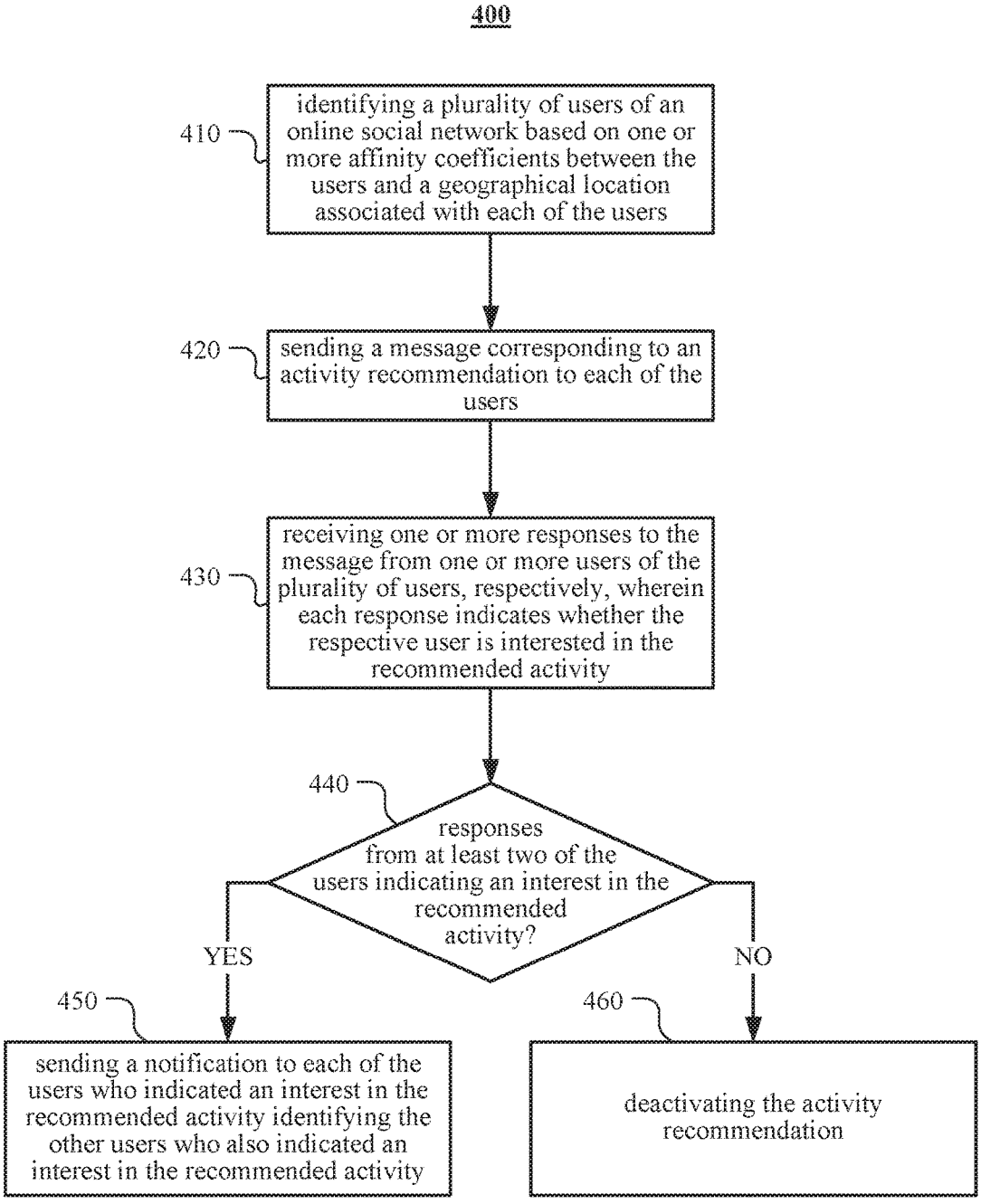
400
410
identifying a plurality of users of an online social network based on one or more affinity coefficients between the users and a geographical location associated with each of the users
420
sending a message corresponding to an activity recommendation to each of the users
430
receiving one or more responses to the message from one or more users of the plurality of users, respectively, wherein each response indicates whether the respective user is interested in the recommended activity
440
responses from at least two of the users indicating an interest in the recommended activity?
YES
NO
450
sending a notification to each of the users who indicated an interest in the recommended activity identifying the other users who also indicated an interest in the recommended activity
460
deactivating the activity recommendation

FIG. 4

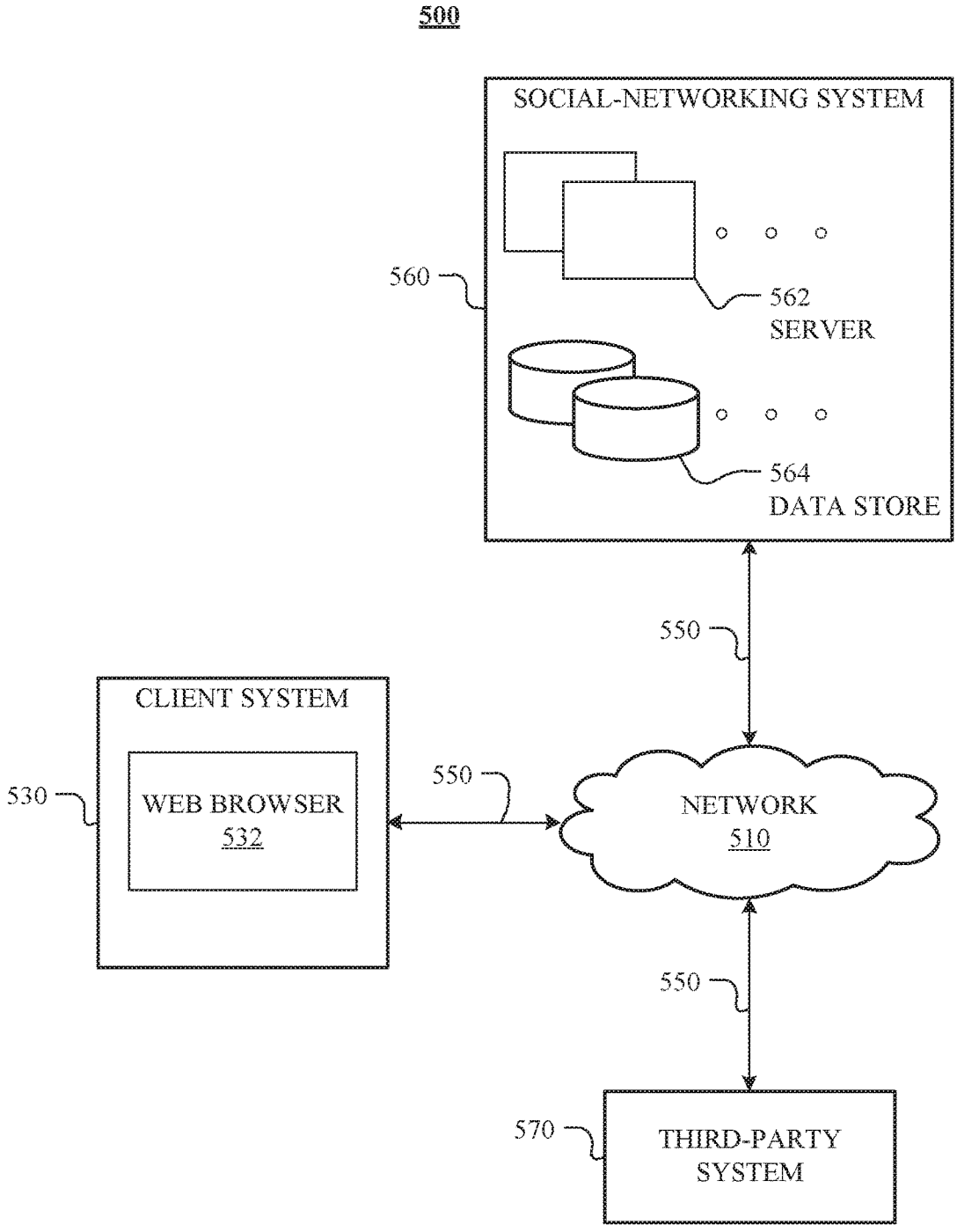
500
SOCIAL-NETWORKING SYSTEM
560
562
SERVER
564
DATA STORE
550
CLIENT SYSTEM
530
WEB BROWSER
532
550
NETWORK
510
550
570
THIRD-PARTY
SYSTEM

FIG. 5

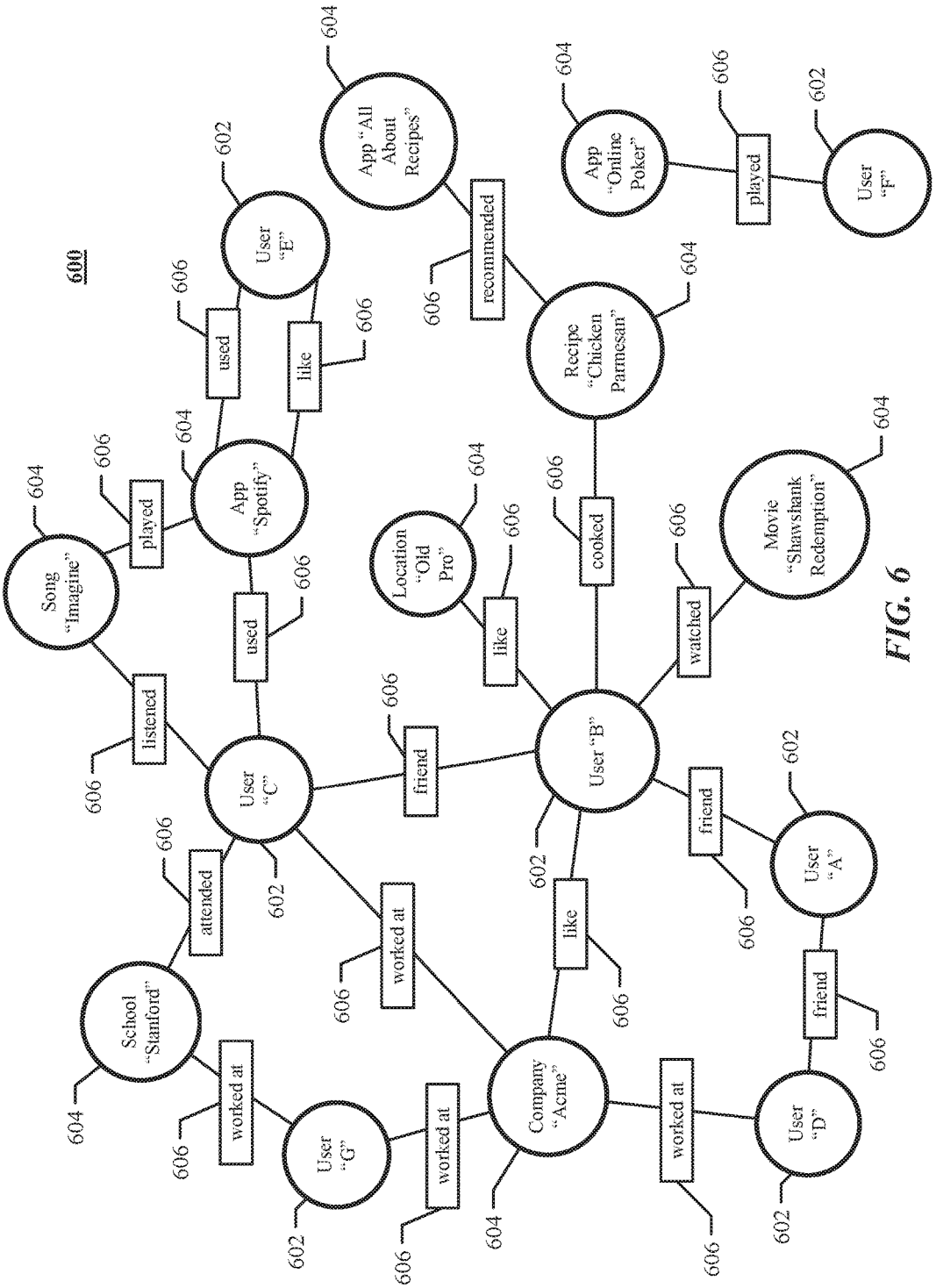
600
User "C"
User "B"
User "A"
User "D"
User "E"
User "F"
User "G"
App "Spotify"
App "All About Recipes"
App "Online Poker"
Song "Imagine"
Location "Old Pro"
Recipe "Chicken Parmesan"
Movie "Shawshank Redemption"
School "Stanford"
Company "Acme"
listened
played
used
like
recommended
played
cooked
watched
friend
attended
worked at
602
604
606

FIG. 6

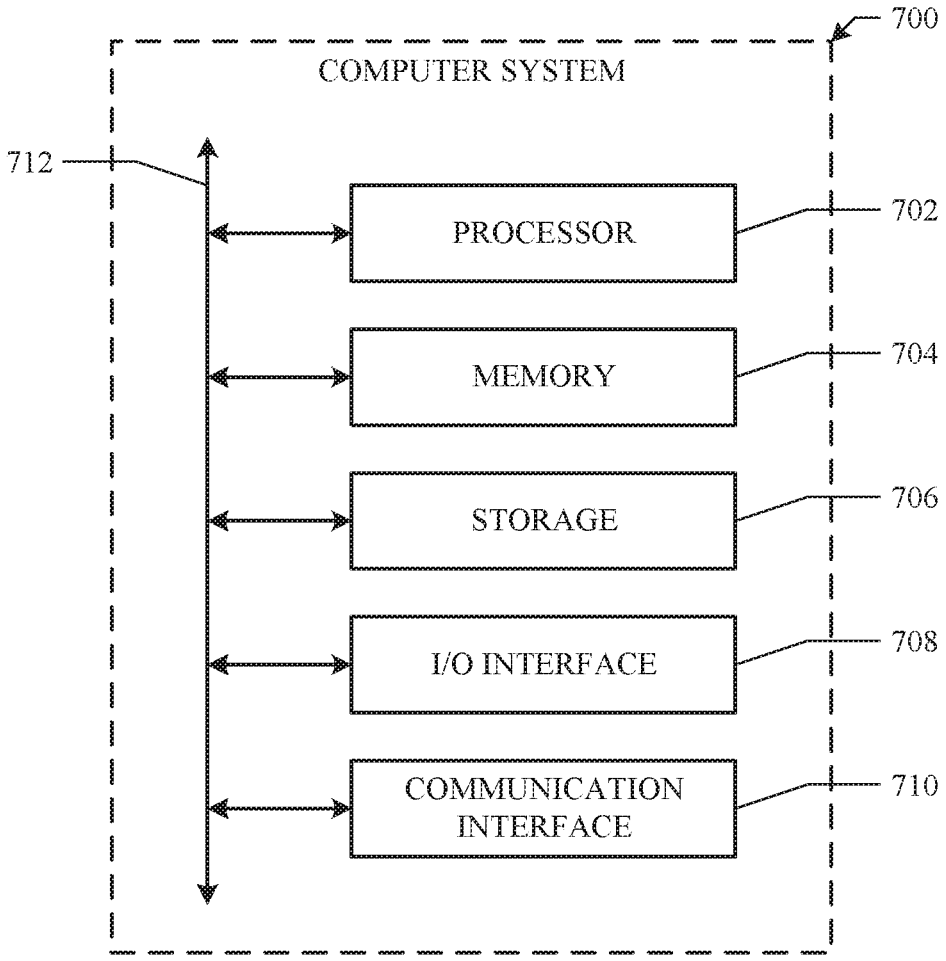
700
COMPUTER SYSTEM
712
PROCESSOR
702
MEMORY
704
STORAGE
706
I/O INTERFACE
708
COMMUNICATION INTERFACE
710

FIG. 7

PEOPLE MATCHING FOR SOCIAL ACTIVITIES ON AN ONLINE SOCIAL NETWORK

TECHNICAL FIELD

[0001] This disclosure generally relates to promoting social activities using an online social network.

BACKGROUND

[0002] A social-networking system, which may include a social-networking website, may enable its users (such as persons or organizations) to interact with it and with each other through it. The social-networking system may, with input from a user, create and store in the social-networking system a user profile associated with the user. The user profile may include demographic information, communication-channel information, and information on personal interests of the user. The social-networking system may also, with input from a user, create and store a record of relationships of the user with other users of the social-networking system, as well as provide services (e.g., wall posts, photo-sharing, event organization, messaging, games, or advertisements) to facilitate social interaction between or among users.

[0003] The social-networking system may send over one or more networks content or messages related to its services to a mobile or other computing device of a user. A user may also install software applications on a mobile or other computing device of the user for accessing a user profile of the user and other data within the social-networking system. The social-networking system may generate a personalized set of content objects to display to a user, such as a newsfeed of aggregated stories of other users connected to the user.

[0004] A mobile computing device—such as a smartphone, tablet computer, or laptop computer—may include functionality for determining its location, direction, or orientation, such as a GPS receiver, compass, gyroscope, or accelerometer. Such a device may also include functionality for wireless communication, such as BLUETOOTH communication, near-field communication (NFC), or infrared (IR) communication or communication with a wireless local area networks (WLANs) or cellular-telephone network. Such a device may also include one or more cameras, scanners, touchscreens, microphones, or speakers. Mobile computing devices may also execute software applications, such as games, web browsers, or social-networking applications. With social-networking applications, users may connect, communicate, and share information with other users in their social networks.

SUMMARY OF PARTICULAR EMBODIMENTS

[0005] In particular embodiments, the social-networking system may facilitate user engagement in real-world social activities by sending users targeted and private "icebreaker" messages and soliciting the user's interest using a double opt-in flow for confirming interest in the social activities. Nowadays, as membership in traditional community institutions declines, so does spending time with people who have common interests through these organizations. The number of people one is connected to and interacts with in the digital world has grown immensely, but it is often the case that one still socializes with relatively few people in real life. At the same time, the stigma around meeting people online is rapidly fading, and more people are open to new ways of meeting others. One primary friction preventing real-world connections is the risk of rejection involved in initiating a social activity. Before two people spend time with each other, one of them must take the initiative to ask others about a particular social activity (e.g., by sending a message), thus risking rejection or awkward communications. Furthermore, there may be a burden of leadership that prevents interest-based activities from occurring and interest groups forming. The task of coalescing a critical mass of individuals for a social activity to occur is often daunting and may be a major deterrence to people. As a result, while there may be significant mutual interest among people to socialize with each other, none of them may be willing to take the initiative or to make the effort to make a plan and organize a social activity. Particular embodiments disclosed herein allow the social-networking system to function as a "matchmaker" for social activities that removes the risk of rejection faced by the users and reduces the burden of planning and coordinating. Particular embodiments disclosed herein may provide a location-based service that is highly customizable to individual users and that exploits data gathered from a plurality of client systems, the computing capabilities of server systems, as well as structured data stored in association with an online social network. The service may employ artificial-intelligence, machine-learning, or other suitable techniques and intelligently grant or restrict user access to particular information using one or more information generating or filtering processes. The service may also offer novel user-interface features that enhance the clarity of displayed social-activity information, facilitate decision-making as to activity recommendations, and save user effort in responding to join or dismiss social activities.

[0006] In particular embodiments, the social-networking system may identify two or more users who are likely to be interested in hanging out with each other and send each of the users a message querying the user's interest in connecting with the other users. The message may be related to a particular activity recommendation and specify time, location, or other details about the recommended activity. As an example and not by way of limitation, the social-networking system may send Jack a message, "Want to hang out with Jill this week?" As another example and not by way of limitation, the social-networking system may send a more specific message, such as "Want to watch the Giants (a professional baseball team) game with Jill on Friday?" The social-networking system may receive one or more responses from one or more of the users indicating whether each user is interested in the recommended activity. When at least a particular number of the users indicate an interested in the recommended activity (e.g., at least two users, all users, etc.), the social-networking system may notify each of the interested users their common interest. As an example and not by way of limitation, if Jack and Jill both indicate an interest in watching the Giants game, the social-networking system may send each of them a notification suggesting them to hang out. The social-networking system may also directly put both Jack and Jill on a message thread to coordinate (for example, by switching context from a social-networking application to a messaging application). On the other hand, if there are not enough users who are interested, the social-networking system may keep each user's response private. In this way, the social-networking system may

leverage its access to user data, its data analysis capabilities, and its platform for users to connect and communicate with each other to facilitate user participation in real-world social activities.

[0007] The embodiments disclosed herein are only examples, and the scope of this disclosure is not limited to them. Particular embodiments may include all, some, or none of the components, elements, features, functions, operations, or steps of the embodiments disclosed above. Embodiments according to the invention are in particular disclosed in the attached claims directed to a method, a storage medium, a system and a computer program product, wherein any feature mentioned in one claim category, e.g. method, can be claimed in another claim category, e.g. system, as well. The dependencies or references back in the attached claims are chosen for formal reasons only. However any subject matter resulting from a deliberate reference back to any previous claims (in particular multiple dependencies) can be claimed as well, so that any combination of claims and the features thereof are disclosed and can be claimed regardless of the dependencies chosen in the attached claims. The subject-matter which can be claimed comprises not only the combinations of features as set out in the attached claims but also any other combination of features in the claims, wherein each feature mentioned in the claims can be combined with any other feature or combination of other features in the claims. Furthermore, any of the embodiments and features described or depicted herein can be claimed in a separate claim and/or in any combination with any embodiment or feature described or depicted herein or with any of the features of the attached claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. **1** illustrates an example user interface displaying a notification of pending activity recommendations.

[0009] FIGS. **2**A-**2**B illustrate an example user interface displaying a list of messages corresponding to activity recommendations.

[0010] FIGS. **3**A-**3**B illustrate example user interfaces displaying detailed views of messages corresponding to activity recommendations.

[0011] FIG. **4** illustrates an example method for facilitating user engagement in social activities through targeted and private messaging and a double opt-in flow.

[0012] FIG. **5** illustrates an example network environment associated with a social-networking system.

[0013] FIG. **6** illustrates an example social graph.

[0014] FIG. **7** illustrates an example computer system.

DESCRIPTION OF EXAMPLE EMBODIMENTS

People Matching for Social Activities

[0015] In particular embodiments, the social-networking system may facilitate user engagement in real-world social activities by sending users targeted and private "icebreaker" messages and soliciting the user's interest using a double opt-in flow for confirming interest in the social activities. Nowadays, as membership in traditional community institutions declines, so does spending time with people who have common interests through these organizations. The number of people one is connected to and interacts with in the digital world has grown immensely, but it is often the case that one still socializes with relatively few people in real life. At the same time, the stigma around meeting people online is rapidly fading, and more people are open to new ways of meeting others. One primary friction preventing real-world connections is the risk of rejection involved in initiating a social activity. Before two people spend time with each other, one of them must take the initiative to ask others about a particular social activity (e.g., by sending a message), thus risking rejection or awkward communications. Furthermore, there may be a burden of leadership that prevents interest-based activities from occurring and interest groups forming. The task of coalescing a critical mass of individuals for a social activity to occur is often daunting and may be a major deterrence to people. As a result, while there may be significant mutual interest among people to socialize with each other, none of them may be willing to take the initiative or to make the effort to make a plan and organize a social activity. Particular embodiments disclosed herein allow the social-networking system to function as a "matchmaker" for social activities that removes the risk of rejection faced by the users and reduces the burden of planning and coordinating. Particular embodiments disclosed herein may provide a location-based service that is highly customizable to individual users and that exploits data gathered from a plurality of client systems, the computing capabilities of server systems, as well as structured data stored in association with an online social network. The service may employ artificial-intelligence, machine-learning, or other suitable techniques and intelligently grant or restrict user access to particular information using one or more information generating or filtering processes. The service may also offer novel user-interface features that enhance the clarity of displayed social-activity information, facilitate decision-making as to activity recommendations, and save user effort in responding to join or dismiss social activities.

[0016] In particular embodiments, the social-networking system may identify two or more users who are likely to be interested in hanging out with each other and send each of the users a message querying the user's interest in connecting with the other users. The message may be related to a particular activity recommendation and specify time, location, or other details about the recommended activity. As an example and not by way of limitation, the social-networking system may send Jack a message, "Want to hang out with Jill this week?" As another example and not by way of limitation, the social-networking system may send a more specific message, such as "Want to watch the Giants (a professional baseball team) game with Jill on Friday?" The social-networking system may receive one or more responses from one or more of the users indicating whether each user is interested in the recommended activity. When at least a particular number of the users indicate an interested in the recommended activity (e.g., at least two users, all users, etc.), the social-networking system may notify each of the interested users their common interest. As an example and not by way of limitation, if Jack and Jill both indicate an interest in watching the Giants game, the social-networking system may send each of them a notification suggesting them to hang out. The social-networking system may also directly put both Jack and Jill on a message thread to coordinate (for example, by switching context from a social-networking application to a messaging application). On the other hand, if there are not enough users who are interested, the social-networking system may keep each user's response

private. In this way, the social-networking system may leverage its access to user data, its data analysis capabilities, and its platform for users to connect and communicate with each other to facilitate user participation in real-world social activities.

[0017] In particular embodiments, the social-networking system may identify a plurality of users of the online social network who are likely to be interested in hanging out with each other. The users may be identified based at least in part on one or more affinity coefficients between the users. The users may additionally or alternatively be identified based at least in part on a geographical location associated with each of the users. In particular embodiments, the social-networking system may identify the plurality of users based on one or more suitable factors other than the affinity coefficients and geographical locations. The use of user information in the identification process may be subject to one or more privacy settings of the users.

[0018] In particular embodiments, the social-networking system may identify the users based at least in part on proximity among one or more of the geographical locations associated with one or more of the users, respectively. The consideration of geographical proximity may serve to make any activity recommended by the social-networking system convenient for the users. Alternatively, the social-networking system may identify one or more users who are not in geographical proximity with each other and suggest the users to travel to participate in a recommended activity.

[0019] In particular embodiments, an affinity coefficient between any two users may quantify the strength of a relationship or level of interest between the users. The affinity coefficient between a given pair of users may be calculated based at least in part on a variety of factors including, for example, a degree of separation between the users in a social graph of the online social network, a commonality between the users (e.g., hometown, education, interest), a social-interaction history between the users, demographic information of the users, other suitable factors, or any combination thereof. The social-networking system may determine that two users having a high affinity coefficient are likely to have a strong relationship and are likely to be interested in hanging out with each other.

[0020] As an example and not by way of limitation, the social-networking system may identify a user John, who lives in Palo Alto, Calif., and a user Jane, who lives in Menlo Park, Calif., which is a city adjacent to Palo Alto. The social-networking system may determine that John and Jane are in geographical proximity with each other as Palo Alto and Menlo Park are neighboring cities. It may further determine that John and Jane have a high affinity coefficient with each other as they are friends on the online social network and interact frequently thereon. The social-networking system may conclude that John and Jane are likely to be interested in hanging out with each other and, accordingly, send an icebreaker message (i.e., a message corresponding to an activity recommendation) to each of them recommending a social activity with the other.

[0021] In particular embodiments, each of the identified users may be within a particular degree of separation within a social graph of the online social network from each of the other identified users. This may allow the social-networking system to shape the nature of the recommended event. In particular embodiments, the identified users may be first-degree contacts (e.g., friends) of each other, first- or second-degree contacts (e.g., friends of friends) of each other, or second- or higher-degree contacts of each other (e.g., strangers) on the online social network. For a particular user, the different degree-of-separation scenarios may correspond to, for example, hangouts with close friends (e.g., first-degree contacts only), party within the user's general social circle (e.g., first- or second-degree contacts only), mixers with non-friends who have mutual friends or common interests (e.g., second-degree contacts only), blind dates (e.g., second- or third-degree contacts only), etc.

[0022] In particular embodiments, the social-networking system may identify the plurality of users further based on one or more selection rules. The selection rules may take into account information about one or more prior messages corresponding to activity recommendations sent by the social-networking system. As an example and not by way of limitation, at least one of the selection rules may specify that identifying one or more of the users is based on a condition that the one or more of the users are not identified for a different activity recommendation within a specified time period. For example, if the social-networking system identified a first user and a second user and sent them an icebreaker message recommending a social activity, the social-networking system may refrain from sending both users another icebreaker message within, for example, a month thereafter. As another example and not by way of limitation, after one or more users who are first-degree contacts with each other all indicate an interest in a particular recommended activity and participated in the activity, the social-networking system may identify each of the interested users and one or more other users who are a first-degree contact with at least one but not all of the interested users for a follow-up activity. Although this disclosure describes identifying particular users in a particular manner, this disclosure contemplates identifying any suitable users in any suitable manner.

[0023] In particular embodiments, the social-networking system may send a message corresponding to an activity recommendation to each of the identified users. The message may comprise identification information of one or more of the other users of the plurality of users and a prompt for a response from the receiving user indicating whether the receiving user is interested in the recommended activity. The prompt for response may be in the form of an icebreaker question (i.e., a question asking whether the receiving user is interested in engaging in the recommended activity with the other users). As an example and not by way of limitation, after identifying users John and Jane as likely to be interested in hanging out with each other, the social-networking system may send John a message comprising the icebreaker question "Want to hang out with Jane this week?" and send Jane a message comprising the icebreaker question "Want to hang out with John this week?"

[0024] In particular embodiments, the activity recommendation sent by the social-networking system may contain a range of amount of details. The message may comprise one or more of a time period associated with the activity recommendation, a geographical location associated with the activity recommendation, a description of the recommended activity, other suitable details, or any combinations thereof. As an example and not by way of limitation, an icebreaker message sent to Jane may broadly suggest her to chat or connect with John in the next month, may specifically

suggest her to get lunch with John this weekend, or to suggest her to have coffee with John at exactly 3 p.m. this Sunday at Starbucks.

[0025] In particular embodiments, the social-networking system may generate the activity recommendation based on a common interest associated with one or more of the identified users. The common interest may be determined based on one or more user profiles associated with the one or more of the identified users, respectively. As an example and not by way of limitation, the social-networking system may access profile information of both John and Jane and determine that both of them are fans of the Seattle Seahawks (a professional football club). The social-networking system may customize an icebreaker message sent to each of John and Jane and ask them to watch a Seattle Seahawks game together.

[0026] In particular embodiments, a social graph associated with the social-networking system may comprise a plurality of nodes and a plurality of edges connecting the nodes. Each of the edges between two of the nodes may represent a single degree of separation between them. The nodes may comprise a plurality of first nodes corresponding to the plurality of identified users and a plurality of second nodes corresponding to a plurality of objects associated with the online social network, respectively. The message corresponding to the activity recommendation sent by the social-networking system may further comprise a reference to an object of the plurality of objects, the object being associated with the activity recommendation. The second node corresponding to the referenced object may be connected to one or more of the first nodes by one or more of the edges, respectively. The reference to objects associated with the online social network may be subject to one or more of the users' privacy settings regarding their connections to other users or objects. As an example and not by way of limitation, the social-networking system may identify the users John and Jane and access their respective nodes in the social graph. The social-networking system may determine that each of the nodes is connected to a node representing the object Stanford University by an edge, as both users are students of Stanford University. Based on this determination, the social-networking system may send John and Jane a message including a recommendation that they go to an on-campus concert, the message referring to the object Stanford University.

[0027] In particular embodiments, the social-networking system may generate the activity recommendation based on one or more prior activities associated with one or more users of the plurality of users, one or more responses to one or more prior messages corresponding to activity recommendations received from one or more users of the plurality of users, one or more upcoming events associated with one or more users of the plurality of users, other suitable factors, or any combination thereof. The social-networking system may record a user's prior responses to icebreaker questions and history of participating in social activities suggested by the social-networking system. Based on such information, the social-networking system may determine the user's interest in a future activity with another user. As an example and not by way of limitation, the social-networking system may access a picture posted by John tagging John, Jane, Jack, and Jill at a football game. The social-networking system may generate an activity recommendation for the four users to go to a future football game based on this prior activity associated with the users. As another example and not by way of limitation, the social-networking system may have previously sent Mary and Mike a message including a recommendation to attend a wine-tasting event. Neither Mary nor Mike responded to the message. The social-networking system may have also sent Mary and Mike a message including a recommendation to attend a beer-tasting event. Both responded to indicate their interest. The social-networking system may thereby determine that Mary and Mike are more interested in beer than in wine and send them an icebreaker question soliciting their interest as to dinner at a local brewery. As yet another example and not by way of limitation, the social-networking system may determine that both Adam and Bob have signed up for a musical show. It may further determine that their homes are five-minute-drive away from each other and are both two-hour-drive away from the theatre. The social-networking system may generate a recommendation that Adam and Bob carpool to the show and send a corresponding message to each of them.

[0028] In particular embodiments, the social-networking system may use an activity-recommendation process. Sending each icebreaker message corresponding to an activity recommendation may be performed as part of the activity-recommendation process of the online social network. The activity-recommendation process may send messages corresponding to activity recommendations at a pre-determined frequency. The frequency may be automatically determined by the social-networking system or be specified by a particular user of the online social network. As an example and not by way of limitation, a user John may receive a plurality of messages from the social-networking system recommending activities with a plurality of other users as part of the activity-recommendation process. The social-networking system may originally send John one message per day. John may be willing to see more options and may change his frequency settings to specify this preference. Based on John's frequency settings, the social-networking system may begin to send John five such icebreaker messages per day. The activity-recommendation process may also track and record a user's responses to messages corresponding to activity recommends. User-specific traits and preferences may be derived from the user's response history.

[0029] In particular embodiments, each activity recommendation may be associated with an expiry date. The social-networking system may deactivate the activity recommendation when the expiry date has passed. As an example and not by way of limitation, the social-networking system may send each of John and Jane a message recommending them to hang out during the upcoming weekend. The social-networking system may set the expiry date for the message to be the Sunday of the specified weekend. If Sunday has passed and neither John nor Jane has responded to the message, the social-networking system may deactivate this activity recommendation. Although this disclosure describes sending particular messages corresponding to particular activity recommendations to particular users in a particular manner, this disclosure contemplates sending any suitable communication to any suitable users in any suitable manner.

[0030] In particular embodiments, the social-networking system may receive one or more responses to the message from one or more users of the plurality of users, respectively. Each response may indicate whether the respective user is

interested in hanging out with the other users identified in the message or in the recommended activity. As an example and not by way of limitation, after sending each of John and Jane a message recommending them to hang out in the upcoming weekend, the social-networking system may receive a "Yes" response from each of the users indicating an interested in the recommended activity. Although this disclosure describes receiving particular responses from particular users in a particular manner, this disclosure contemplates receiving any suitable communications from any suitable users in any suitable manner.

[0031] FIG. **1** illustrates an example user interface displaying a notification of pending activity recommendations. In particular embodiments, the social-networking system may send a notification **110** associated with icebreaker messages to a client system **530** associated with a user for display. The notification **110** may be a push notification by an application associated with the social-networking system or another suitable type of notification. It may be displayed in a lock-screen user interface. The notification **110** may indicate to the user that messages corresponding to activity recommendations are pending and provide a count of such messages. The user may interact with the notification **110** to open the application associated with the social-networking system and access the messages. Although FIG. **1** illustrates a particular user interface displaying a particular notification in a particular manner, this disclosure contemplates any suitable user interface displaying any suitable notification in any suitable manner.

[0032] FIGS. **2**A-**2**B illustrate an example user interface displaying a list of messages corresponding to activity recommendations. In particular embodiments, the social-networking system may provide for display a user interface **210** comprising one or more icebreaker messages for a particular user. The user interface **210** may be displayed within an application associated with social-networking system, within a web browser, or within another suitable application. The user interface **210** may comprise icebreaker messages **220**. Each of the icebreaker messages **220** may correspond to an activity recommendation generated by the social-networking system. In particular embodiments, each icebreaker message **220** may comprise a text section **222** identifying one or more other users and describing a recommended activity. Each icebreaker message **220** may also comprise one or more profile pictures **224** associated with the identified users. Each icebreaker message **220** may further comprise one or more interactive elements **226** allowing the user to input a response. As an example and not by way of limitation, the user may click or tap on the "I'm In" button to indicate an interest in the recommended activity. The user may click or tap on the "No thanks" button to indicate a lack of interest, upon which the corresponding icebreaker message **220** may be dismissed and removed from the user interface **210**. The user interface **210** may comprise a search field **215** allowing a user to search for one or more of the icebreaker messages **220** by entering a text string. The user interface **210** may further comprise a message **230** that includes a question **232** asking if the user is interested in a new type of icebreaker messages (e.g., potential dates). The user may interact with interactive elements **234** to indicate an interest (e.g., "Learn More") or a lack of interest (e.g., "No Thanks"). If the user indicates an interest, the social-networking system may proceed to provide one or more icebreaker messages recommending dates with strangers.

[0033] In particular embodiments, the activity recommendations provided by the social-networking system may contain different levels of details. As an example and not by way of limitation, the icebreaker message **220***a* may specify in section **222***a* a specific activity (i.e., get lunch) and a specific day (i.e., tomorrow). As another example and not by way of limitation, the icebreaker message **220***b* may only comprise a high level question **222***b* ("Hang out with Rachel, Jamie, and Will this weekend?"). As yet another example and not by way of limitation, the icebreaker message **220***d* may provide specific details in section **222***d*, including a specific activity (i.e., get dinner), a specific time (tomorrow night at 8:00 pm), and a specific location (e.g., Lolinda). In particular embodiments, the social-networking system may recommend social activities associated with other users having different degrees of separation from the user. As an example and not by way of limitation, the icebreaker message **220***d* recommends an activity with a first-degree contact Peter. As another example and not by way of limitation, the icebreaker message **220***c* recommends an activity with a first-degree contact John and a second-degree contact Nancy. Although FIGS. **2**A-**2**B illustrate a particular user interface displaying particular messages in a particular manner, this disclosure contemplates any suitable user interface displaying any suitable messages in any suitable manner.

[0034] FIGS. **3**A-**3**B illustrate example user interfaces displaying detailed views of messages corresponding to activity recommendations. In particular embodiments, the social-networking system may provide a detailed view for each icebreaker message. The user may access the detailed view by, for example, tapping on an icebreaker message **220** in the user interface **210**. As illustrated by FIG. **3**A, the detailed view **310** may comprise an icebreaker question **312** ("Want to go out for drinks tomorrow night?"), identification information for one or more other identified users **314**, and a text string **316** explaining a privacy status of the message **310**. For example, the text string may explain that "[n]o one will know if you're in unless (s)he is in." The detailed view **310** may further comprise interactive elements **318** allowing the user to respond.

[0035] Similarly, the detailed view **320** may comprise an icebreaker question **322** ("Want to get lunch this weekend?"), identification information for one or more other identified users **324**, and a text string **326** explaining a privacy status of the message **320**. The privacy status for the message **320** may be different from that for the message **310**. For example, each of the users identified in the message **320** may get informed about whether each other user is interested in the event only if everyone is in. The detailed view **320** may further comprise interactive elements **328** allowing the user to respond. Although FIGS. **3**A-**3**B illustrate particular views of particular messages displayed in a particular manner, this disclosure contemplates any suitable views of any suitable messages displayed in any suitable manner.

[0036] In particular embodiments, the social-networking system may take one or more follow-up steps according to a double opt-in flow responsive to receiving one or more responses from the users. The social-networking system may require a threshold number (e.g., two, five, ten) of positive responses to an icebreaker question before notifying any user of other user's interest. As an example and not by

way of limitation, if the response from each of at least two of the users indicates an interest in a recommended activity, then the social-networking system may send a notification to each of the users who indicated an interest in the recommended activity identifying the other users who also indicated an interest in the recommended activity. Alternatively, the social-networking system may require a positive response from each of the users who received the icebreaker message in order to notify any of the users. If the social-networking system fails to receive the threshold number of positive responses from the users within a particular timeframe, it may refrain from notifying any user about the decisions of other users and deactivate the activity recommendation. The social-networking system may deactivate the activity recommendation immediately after it receives a certain number of rejections of the activity recommendation or when an expiry date associated with activity recommendation passes without receiving a sufficient number of positive responses. In this manner, a user's interest in a particular activity is only revealed to a number of other users who also indicate their interest. This protects each user's privacy and removes the risk of rejection that a user would normally face in initiating a social activity.

[0037] In particular embodiments, the social-networking system may send the notification to each of the users who indicated an interest in the recommended activity identifying the other users who also indicated an interest in the recommended activity in one or more different manners. As an example and not by way of limitation, the social-networking system may initiate a message thread including each of the users who indicated an interest in the recommended activity, on which the users may communicate to coordinate the activity. As another example and not by way of limitation, the social-networking system may send each user a push notification, a direct message, a wall post, an email, an SMS message, another suitable type of communication, or any combination thereof. As yet another example and not by way of limitation, the social-networking system may generate an event object on the online social network with the users who indicated an interest in the recommended activity as invitees. The event object may comprise information associated with the activity recommendation; such information may be modifiable by the invited users.

[0038] As an example and not by way of limitation, the social-networking system may send each of users John, Jane, Jack, and Jill an icebreaker message comprising an activity recommendation to hang out with the other three users. In one scenario, the four users may each respond to indicate an interest in the recommended activity. The social-networking system may accordingly initiate a message thread including all four users for them to coordinate the activity. In another scenario, John may respond to the icebreaker message indicating an interest in the recommended activity. Jane and Jack may respond to reject the activity recommendation. Jill may not respond to the icebreaker message within a pre-determined one-week time limitation for it. In this case, the social-networking system may deactivate the activity recommendation without notifying any of the users about other users' responses. Although this disclosure describes sending particular notifications to particular users in a particular manner, this disclosure contemplates sending any suitable communications to any suitable users in any suitable manner.

[0039] In particular embodiments, the social-networking system may identify a group of users for an activity recommendation using an iterative process. The social-networking system may first send an icebreaker message to a plurality of first users and receive a response from each of at least two of the first users indicating an interest in the recommended activity. The social-networking system may identify one or more second users of the online social network based on social-networking information associated with the at least two of the first users. The identified second users may be social contacts of the at least two of the first users. The social-networking system may then send the message corresponding to the activity recommendation to each of the second users and receive one or more responses to the message from one or more second users, respectively, each response indicating that the respective second user is interested in the recommended activity. The social-networking system may send an additional notification to each of the users (including first users and second users) who indicated an interest in the recommended activity identifying the other users who also indicated an interest in the recommended activity.

[0040] As an example and not by way of limitation, the social-networking system may identify a group of first users who are likely to be interested in an event and send an icebreaker question to each of the first users. For example, the social-networking system may send a message to each member of an outdoor recreation club recommending a hiking trip in the Rocky Mountains. The social-networking system may receive responses from two of the first users John and Jane indicating an interest in the recommended activity. Based on the responses, the social-networking system may identify one or more second users based on social-networking information associated with John and Jane. The second users may not be in the original group of users, but may be social connections of the two first users. For example, the social-networking system may identify Mary and Mike, who are not members of the outdoor recreation club, but are both first-degree friends of John and Jane and both live in the Rocky Mountain area. The social-networking system may also determine that the two first users, John and Jane, and the two second users, Mary and Mike, are likely to be interested in hanging out with each other. The social-networking system may then send updated icebreaker messages to each of the four users to verify their interests.

[0041] In particular embodiments, the social-networking system may identify, for a particular user, one or more other users that the particular user is interested in hanging out with based on relevant historical records. For a first user, the social-networking system may record one or more responses by the first user to one or more prior messages corresponding to activity recommendations and identify one or more second users identified in the prior messages. Based on the recorded responses, the social-networking system may compile a list of users of interest to the first user, the list comprising one or more of the second users. The list of users may comprise one or more close friends of the first user, with whom the first user would like to frequently socialize. The social-networking system may accordingly recommend future activities involving the first user and other users on the first user's list.

[0042] In particular embodiments, the social-networking system may allow a user to affirmatively provide a list of

other users of interest. The social-networking system may store this list received from the user and repetitively provide icebreaker messages involving the user providing the list and the listed users suggesting different times, locations, and activities. In particular embodiments, the plurality of users identified for a particular activity recommendation may comprise a first user and one or more second users identified in a list of users of interest to the first user received from the first user.

[0043] In particular embodiments, the social-networking system may provide icebreaker questions in a privacy-aware manner. It may access privacy settings of the users to make sure that icebreaker questions do not reveal facts (e.g., geographical location, school, friend list) that are not visible (i.e., non-public or inaccessible) to particular users. In particular embodiments, for each user of the plurality of identified users, the social-networking system may access one or more privacy settings associated with the user and determining, based on the privacy settings and prior to sending the icebreaker message, that the geographical location of the user is visible to each of the other users of the plurality of users. As an example and not by way of limitation, a profile of a user John on the online social network may indicate that he currently lives in San Francisco. John may have marked such location information private or invisible to anyone but himself. Based on John's privacy settings, the social-networking system may refrain from including John in an icebreaker message recommending a local activity in San Francisco because one or more other users may infer that John lives in San Francisco based on the message.

[0044] In particular embodiments, for each user of the plurality of identified users, the social-networking system may access one or more privacy settings associated with the user and verifying, based on the privacy settings and prior to sending the message, that information associated with the user in the message is visible to each of the other users of the plurality of users. As an example and not by way of limitation, a user Jane may make information about her education history, including her alma mater Stanford University, private. In this case, the social-networking system may refrain from sending Jane an icebreaker message recommending her to attend an alumni event of Stanford University to avoid disclosing Jane's education information to another user. As another example and not by way of limitation, if a user Jack's privacy settings make his friend relationship with another user Jill private, the social-networking system may refrain from sending an icebreaker message to James suggesting him to hang out with Jack and Jill. This is because James may figure out that Jack and Jill are friends on the online social network based on the message.

[0045] FIG. **4** illustrates an example method **400** for facilitating user engagement in social activities through targeted and private messaging and a double opt-in flow. The method may begin at step **410**, where a social-networking system may identify a plurality of users of an online social network based on one or more affinity coefficients between the users and a geographical location associated with each of the users. At step **420**, the social-networking system may send a message corresponding to an activity recommendation to each of the users. The message may comprise identification information of one or more of the other users of the plurality of users and a prompt for a response from the receiving user indicating whether the receiving user is interested in the recommended activity. At step **430**, the social-networking system may receive one or more responses to the message from one or more users of the plurality of users, respectively. Each response indicates whether the respective user is interested in the recommended activity. At step **440**, the social-networking system may determine if it has received responses from at least two of the users, each indicating an interest in the recommended activity. If so, the social-networking system may proceed to step **450** and send a notification to each of the users who indicated an interest in the recommended activity identifying the other users who also indicated an interest in the recommended activity. Otherwise, the social-networking system may proceed to step **460** and deactivate the activity recommendation. Particular embodiments may repeat one or more steps of the method of FIG. **4**, where appropriate. Although this disclosure describes and illustrates particular steps of the method of FIG. **4** as occurring in a particular order, this disclosure contemplates any suitable steps of the method of FIG. **4** occurring in any suitable order. Moreover, although this disclosure describes and illustrates an example method for facilitating user engagement in social activities through targeted and private messaging and a double opt-in flow including the particular steps of the method of FIG. **4**, this disclosure contemplates any suitable method for facilitating user engagement in social activities through targeted and private messaging and a double opt-in flow including any suitable steps, which may include all, some, or none of the steps of the method of FIG. **4**, where appropriate. Furthermore, although this disclosure describes and illustrates particular components, devices, or systems carrying out particular steps of the method of FIG. **4**, this disclosure contemplates any suitable combination of any suitable components, devices, or systems carrying out any suitable steps of the method of FIG. **4**.

System Overview

[0046] FIG. **5** illustrates an example network environment **500** associated with a social-networking system. Network environment **500** includes a client system **530**, a social-networking system **560**, and a third-party system **570** connected to each other by a network **510**. Although FIG. **5** illustrates a particular arrangement of client system **530**, social-networking system **560**, third-party system **570**, and network **510**, this disclosure contemplates any suitable arrangement of client system **530**, social-networking system **560**, third-party system **570**, and network **510**. As an example and not by way of limitation, two or more of client system **530**, social-networking system **560**, and third-party system **570** may be connected to each other directly, bypassing network **510**. As another example, two or more of client system **530**, social-networking system **560**, and third-party system **570** may be physically or logically co-located with each other in whole or in part. Moreover, although FIG. **5** illustrates a particular number of client systems **530**, social-networking systems **560**, third-party systems **570**, and networks **510**, this disclosure contemplates any suitable number of client systems **530**, social-networking systems **560**, third-party systems **570**, and networks **510**. As an example and not by way of limitation, network environment **500** may include multiple client system **530**, social-networking systems **560**, third-party systems **570**, and networks **510**.

[0047] This disclosure contemplates any suitable network **510**. As an example and not by way of limitation, one or more portions of network **510** may include an ad hoc network, an intranet, an extranet, a virtual private network (VPN), a local area network (LAN), a wireless LAN (WLAN), a wide area network (WAN), a wireless WAN (WWAN), a metropolitan area network (MAN), a portion of the Internet, a portion of the Public Switched Telephone Network (PSTN), a cellular telephone network, or a combination of two or more of these. Network **510** may include one or more networks **510**.

[0048] Links **550** may connect client system **530**, social-networking system **560**, and third-party system **570** to communication network **510** or to each other. This disclosure contemplates any suitable links **550**. In particular embodiments, one or more links **550** include one or more wireline (such as for example Digital Subscriber Line (DSL) or Data Over Cable Service Interface Specification (DOCSIS)), wireless (such as for example Wi-Fi or Worldwide Interoperability for Microwave Access (WiMAX)), or optical (such as for example Synchronous Optical Network (SONET) or Synchronous Digital Hierarchy (SDH)) links. In particular embodiments, one or more links **550** each include an ad hoc network, an intranet, an extranet, a VPN, a LAN, a WLAN, a WAN, a WWAN, a MAN, a portion of the Internet, a portion of the PSTN, a cellular technology-based network, a satellite communications technology-based network, another link **550**, or a combination of two or more such links **550**. Links **550** need not necessarily be the same throughout network environment **500**. One or more first links **550** may differ in one or more respects from one or more second links **550**.

[0049] In particular embodiments, client system **530** may be an electronic device including hardware, software, or embedded logic components or a combination of two or more such components and capable of carrying out the appropriate functionalities implemented or supported by client system **530**. As an example and not by way of limitation, a client system **530** may include a computer system such as a desktop computer, notebook or laptop computer, netbook, a tablet computer, e-book reader, GPS device, camera, personal digital assistant (PDA), handheld electronic device, cellular telephone, smartphone, augmented/virtual reality device, other suitable electronic device, or any suitable combination thereof. This disclosure contemplates any suitable client systems **530**. A client system **530** may enable a network user at client system **530** to access network **510**. A client system **530** may enable its user to communicate with other users at other client systems **530**.

[0050] In particular embodiments, client system **530** may include a web browser **532**, such as MICROSOFT INTERNET EXPLORER, GOOGLE CHROME or MOZILLA FIREFOX, and may have one or more add-ons, plug-ins, or other extensions, such as TOOLBAR or YAHOO TOOLBAR. A user at client system **530** may enter a Uniform Resource Locator (URL) or other address directing the web browser **532** to a particular server (such as server **562**, or a server associated with a third-party system **570**), and the web browser **532** may generate a Hyper Text Transfer Protocol (HTTP) request and communicate the HTTP request to server. The server may accept the HTTP request and communicate to client system **530** one or more Hyper Text Markup Language (HTML) files responsive to the HTTP request. Client system **530** may render a webpage based on the HTML files from the server for presentation to the user. This disclosure contemplates any suitable webpage files. As an example and not by way of limitation, webpages may render from HTML files, Extensible Hyper Text Markup Language (XHTML) files, or Extensible Markup Language (XML) files, according to particular needs. Such pages may also execute scripts such as, for example and without limitation, those written in JAVASCRIPT, JAVA, MICROSOFT SILVERLIGHT, combinations of markup language and scripts such as AJAX (Asynchronous JAVASCRIPT and XML), and the like. Herein, reference to a webpage encompasses one or more corresponding webpage files (which a browser may use to render the webpage) and vice versa, where appropriate.

[0051] In particular embodiments, social-networking system **560** may be a network-addressable computing system that can host an online social network. Social-networking system **560** may generate, store, receive, and send social-networking data, such as, for example, user-profile data, concept-profile data, social-graph information, or other suitable data related to the online social network. Social-networking system **560** may be accessed by the other components of network environment **500** either directly or via network **510**. As an example and not by way of limitation, client system **530** may access social-networking system **560** using a web browser **532**, or a native application associated with social-networking system **560** (e.g., a mobile social-networking application, a messaging application, another suitable application, or any combination thereof) either directly or via network **510**. In particular embodiments, social-networking system **560** may include one or more servers **562**. Each server **562** may be a unitary server or a distributed server spanning multiple computers or multiple datacenters. Servers **562** may be of various types, such as, for example and without limitation, web server, news server, mail server, message server, advertising server, file server, application server, exchange server, database server, proxy server, another server suitable for performing functions or processes described herein, or any combination thereof. In particular embodiments, each server **562** may include hardware, software, or embedded logic components or a combination of two or more such components for carrying out the appropriate functionalities implemented or supported by server **562**. In particular embodiments, social-networking system **560** may include one or more data stores **564**. Data stores **564** may be used to store various types of information. In particular embodiments, the information stored in data stores **564** may be organized according to specific data structures. In particular embodiments, each data store **564** may be a relational, columnar, correlation, or other suitable database. Although this disclosure describes or illustrates particular types of databases, this disclosure contemplates any suitable types of databases. Particular embodiments may provide interfaces that enable a client system **530**, a social-networking system **560**, or a third-party system **570** to manage, retrieve, modify, add, or delete, the information stored in data store **564**.

[0052] In particular embodiments, social-networking system **560** may store one or more social graphs in one or more data stores **564**. In particular embodiments, a social graph may include multiple nodes—which may include multiple user nodes (each corresponding to a particular user) or multiple concept nodes (each corresponding to a particular concept)—and multiple edges connecting the nodes. Social-

networking system **560** may provide users of the online social network the ability to communicate and interact with other users. In particular embodiments, users may join the online social network via social-networking system **560** and then add connections (e.g., relationships) to a number of other users of social-networking system **560** to whom they want to be connected. Herein, the term "friend" may refer to any other user of social-networking system **560** with whom a user has formed a connection, association, or relationship via social-networking system **560**.

[0053] In particular embodiments, social-networking system **560** may provide users with the ability to take actions on various types of items or objects, supported by social-networking system **560**. As an example and not by way of limitation, the items and objects may include groups or social networks to which users of social-networking system **560** may belong, events or calendar entries in which a user might be interested, computer-based applications that a user may use, transactions that allow users to buy or sell items via the service, interactions with advertisements that a user may perform, or other suitable items or objects. A user may interact with anything that is capable of being represented in social-networking system **560** or by an external system of third-party system **570**, which is separate from social-networking system **560** and coupled to social-networking system **560** via a network **510**.

[0054] In particular embodiments, social-networking system **560** may be capable of linking a variety of entities. As an example and not by way of limitation, social-networking system **560** may enable users to interact with each other as well as receive content from third-party systems **570** or other entities, or to allow users to interact with these entities through an application programming interfaces (API) or other communication channels.

[0055] In particular embodiments, a third-party system **570** may include one or more types of servers, one or more data stores, one or more interfaces, including but not limited to APIs, one or more web services, one or more content sources, one or more networks, or any other suitable components, e.g., that servers may communicate with. A third-party system **570** may be operated by a different entity from an entity operating social-networking system **560**. In particular embodiments, however, social-networking system **560** and third-party systems **570** may operate in conjunction with each other to provide social-networking services to users of social-networking system **560** or third-party systems **570**. In this sense, social-networking system **560** may provide a platform, or backbone, which other systems, such as third-party systems **570**, may use to provide social-networking services and functionality to users across the Internet.

[0056] In particular embodiments, a third-party system **570** may include a third-party content object provider. A third-party content object provider may include one or more sources of content objects, which may be communicated to a client system **530**. As an example and not by way of limitation, content objects may include information regarding things or activities of interest to the user, such as, for example, movie show times, movie reviews, restaurant reviews, restaurant menus, product information and reviews, or other suitable information. As another example and not by way of limitation, content objects may include incentive content objects, such as coupons, discount tickets, gift certificates, or other suitable incentive objects.

[0057] In particular embodiments, social-networking system **560** also includes user-generated content objects, which may enhance a user's interactions with social-networking system **560**. User-generated content may include anything a user can add, upload, send, or "post" to social-networking system **560**. As an example and not by way of limitation, a user communicates posts to social-networking system **560** from a client system **530**. Posts may include data such as status updates or other textual data, location information, photos, videos, links, music or other similar data or media. Content may also be added to social-networking system **560** by a third-party through a "communication channel," such as a newsfeed or stream.

[0058] In particular embodiments, social-networking system **560** may include a variety of servers, sub-systems, programs, modules, logs, and data stores. In particular embodiments, social-networking system **560** may include one or more of the following: a web server, action logger, API-request server, relevance-and-ranking engine, content-object classifier, notification controller, action log, third-party-content-object-exposure log, inference module, authorization/privacy server, search module, advertisement-targeting module, user-interface module, user-profile store, connection store, third-party content store, or location store. Social-networking system **560** may also include suitable components such as network interfaces, security mechanisms, load balancers, failover servers, management-and-network-operations consoles, other suitable components, or any suitable combination thereof. In particular embodiments, social-networking system **560** may include one or more user-profile stores for storing user profiles. A user profile may include, for example, biographic information, demographic information, behavioral information, social information, or other types of descriptive information, such as work experience, educational history, hobbies or preferences, interests, affinities, or location. Interest information may include interests related to one or more categories. Categories may be general or specific. As an example and not by way of limitation, if a user "likes" an article about a brand of shoes the category may be the brand, or the general category of "shoes" or "clothing." A connection store may be used for storing connection information about users. The connection information may indicate users who have similar or common work experience, group memberships, hobbies, educational history, or are in any way related or share common attributes. The connection information may also include user-defined connections between different users and content (both internal and external). A web server may be used for linking social-networking system **560** to one or more client systems **530** or one or more third-party system **570** via network **510**. The web server may include a mail server or other messaging functionality for receiving and routing messages between social-networking system **560** and one or more client systems **530**. An API-request server may allow a third-party system **570** to access information from social-networking system **560** by calling one or more APIs. An action logger may be used to receive communications from a web server about a user's actions on or off social-networking system **560**. In conjunction with the action log, a third-party-content-object log may be maintained of user exposures to third-party-content objects. A notification controller may provide information regarding content objects to a client system **530**. Information may be pushed to a client system **530** as notifications, or information

may be pulled from client system **530** responsive to a request received from client system **530**. Authorization servers may be used to enforce one or more privacy settings of the users of social-networking system **560**. A privacy setting of a user determines how particular information associated with a user can be shared. The authorization server may allow users to opt in to or opt out of having their actions logged by social-networking system **560** or shared with other systems (e.g., third-party system **570**), such as, for example, by setting appropriate privacy settings. Third-party-content-object stores may be used to store content objects received from third parties, such as a third-party system **570**. Location stores may be used for storing location information received from client systems **530** associated with users. Advertisement-pricing modules may combine social information, the current time, location information, or other suitable information to provide relevant advertisements, in the form of notifications, to a user.

Social Graphs

[0059] FIG. **6** illustrates example social graph **600**. In particular embodiments, social-networking system **560** may store one or more social graphs **600** in one or more data stores. In particular embodiments, social graph **600** may include multiple nodes—which may include multiple user nodes **602** or multiple concept nodes **604**—and multiple edges **606** connecting the nodes. Example social graph **600** illustrated in FIG. **6** is shown, for didactic purposes, in a two-dimensional visual map representation. In particular embodiments, a social-networking system **560**, client system **530**, or third-party system **570** may access social graph **600** and related social-graph information for suitable applications. The nodes and edges of social graph **600** may be stored as data objects, for example, in a data store (such as a social-graph database). Such a data store may include one or more searchable or queryable indexes of nodes or edges of social graph **600**.

[0060] In particular embodiments, a user node **602** may correspond to a user of social-networking system **560**. As an example and not by way of limitation, a user may be an individual (human user), an entity (e.g., an enterprise, business, or third-party application), or a group (e.g., of individuals or entities) that interacts or communicates with or over social-networking system **560**. In particular embodiments, when a user registers for an account with social-networking system **560**, social-networking system **560** may create a user node **602** corresponding to the user, and store the user node **602** in one or more data stores. Users and user nodes **602** described herein may, where appropriate, refer to registered users and user nodes **602** associated with registered users. In addition or as an alternative, users and user nodes **602** described herein may, where appropriate, refer to users that have not registered with social-networking system **560**. In particular embodiments, a user node **602** may be associated with information provided by a user or information gathered by various systems, including social-networking system **560**. As an example and not by way of limitation, a user may provide his or her name, profile picture, contact information, birth date, sex, marital status, family status, employment, education background, preferences, interests, or other demographic information. In particular embodiments, a user node **602** may be associated with one or more data objects corresponding to information associated with a user. In particular embodiments, a user node **602** may correspond to one or more webpages.

[0061] In particular embodiments, a concept node **604** may correspond to a concept. As an example and not by way of limitation, a concept may correspond to a place (such as, for example, a movie theater, restaurant, landmark, or city); a website (such as, for example, a website associated with social-network system **560** or a third-party website associated with a web-application server); an entity (such as, for example, a person, business, group, sports team, or celebrity); a resource (such as, for example, an audio file, video file, digital photo, text file, structured document, or application) which may be located within social-networking system **560** or on an external server, such as a web-application server; real or intellectual property (such as, for example, a sculpture, painting, movie, game, song, idea, photograph, or written work); a game; an activity; an idea or theory; an object in a augmented/virtual reality environment; another suitable concept; or two or more such concepts. A concept node **604** may be associated with information of a concept provided by a user or information gathered by various systems, including social-networking system **560**. As an example and not by way of limitation, information of a concept may include a name or a title; one or more images (e.g., an image of the cover page of a book); a location (e.g., an address or a geographical location); a website (which may be associated with a URL); contact information (e.g., a phone number or an email address); other suitable concept information; or any suitable combination of such information. In particular embodiments, a concept node **604** may be associated with one or more data objects corresponding to information associated with concept node **604**. In particular embodiments, a concept node **604** may correspond to one or more webpages.

[0062] In particular embodiments, a node in social graph **600** may represent or be represented by a webpage (which may be referred to as a "profile page"). Profile pages may be hosted by or accessible to social-networking system **560**. Profile pages may also be hosted on third-party websites associated with a third-party system **570**. As an example and not by way of limitation, a profile page corresponding to a particular external webpage may be the particular external webpage and the profile page may correspond to a particular concept node **604**. Profile pages may be viewable by all or a selected subset of other users. As an example and not by way of limitation, a user node **602** may have a corresponding user-profile page in which the corresponding user may add content, make declarations, or otherwise express himself or herself. As another example and not by way of limitation, a concept node **604** may have a corresponding concept-profile page in which one or more users may add content, make declarations, or express themselves, particularly in relation to the concept corresponding to concept node **604**.

[0063] In particular embodiments, a concept node **604** may represent a third-party webpage or resource hosted by a third-party system **570**. The third-party webpage or resource may include, among other elements, content, a selectable or other icon, or other inter-actable object (which may be implemented, for example, in JavaScript, AJAX, or PHP codes) representing an action or activity. As an example and not by way of limitation, a third-party webpage may include a selectable icon such as "like," "check-in," "eat," "recommend," or another suitable action or activity. A user viewing the third-party webpage may perform an action by

selecting one of the icons (e.g., "check-in"), causing a client system **530** to send to social-networking system **560** a message indicating the user's action. In response to the message, social-networking system **560** may create an edge (e.g., a check-in-type edge) between a user node **602** corresponding to the user and a concept node **604** corresponding to the third-party webpage or resource and store edge **606** in one or more data stores.

[0064] In particular embodiments, a pair of nodes in social graph **600** may be connected to each other by one or more edges **606**. An edge **606** connecting a pair of nodes may represent a relationship between the pair of nodes. In particular embodiments, an edge **606** may include or represent one or more data objects or attributes corresponding to the relationship between a pair of nodes. As an example and not by way of limitation, a first user may indicate that a second user is a "friend" of the first user. In response to this indication, social-networking system **560** may send a "friend request" to the second user. If the second user confirms the "friend request," social-networking system **560** may create an edge **606** connecting the first user's user node **602** to the second user's user node **602** in social graph **600** and store edge **606** as social-graph information in one or more of data stores **564**. In the example of FIG. **6**, social graph **600** includes an edge **606** indicating a friend relation between user nodes **602** of user "A" and user "B" and an edge indicating a friend relation between user nodes **602** of user "C" and user "B." Although this disclosure describes or illustrates particular edges **606** with particular attributes connecting particular user nodes **602**, this disclosure contemplates any suitable edges **606** with any suitable attributes connecting user nodes **602**. As an example and not by way of limitation, an edge **606** may represent a friendship, family relationship, business or employment relationship, fan relationship (including, e.g., liking, etc.), follower relationship, visitor relationship (including, e.g., accessing, viewing, checking-in, sharing, etc.), subscriber relationship, superior/subordinate relationship, reciprocal relationship, non-reciprocal relationship, another suitable type of relationship, or two or more such relationships. Moreover, although this disclosure generally describes nodes as being connected, this disclosure also describes users or concepts as being connected. Herein, references to users or concepts being connected may, where appropriate, refer to the nodes corresponding to those users or concepts being connected in social graph **600** by one or more edges **606**.

[0065] In particular embodiments, an edge **606** between a user node **602** and a concept node **604** may represent a particular action or activity performed by a user associated with user node **602** toward a concept associated with a concept node **604**. As an example and not by way of limitation, as illustrated in FIG. **6**, a user may "like," "attended," "played," "listened," "cooked," "worked at," or "watched" a concept, each of which may correspond to an edge type or subtype. A concept-profile page corresponding to a concept node **604** may include, for example, a selectable "check in" icon (such as, for example, a clickable "check in" icon) or a selectable "add to favorites" icon. Similarly, after a user clicks these icons, social-networking system **560** may create a "favorite" edge or a "check in" edge in response to a user's action corresponding to a respective action. As another example and not by way of limitation, a user (user "C") may listen to a particular song ("Imagine") using a particular application (SPOTIFY, which is an online music application). In this case, social-networking system **560** may create a "listened" edge **606** and a "used" edge (as illustrated in FIG. **6**) between user nodes **602** corresponding to the user and concept nodes **604** corresponding to the song and application to indicate that the user listened to the song and used the application. Moreover, social-networking system **560** may create a "played" edge **606** (as illustrated in FIG. **6**) between concept nodes **604** corresponding to the song and the application to indicate that the particular song was played by the particular application. In this case, "played" edge **606** corresponds to an action performed by an external application (SPOTIFY) on an external audio file (the song "Imagine"). Although this disclosure describes particular edges **606** with particular attributes connecting user nodes **602** and concept nodes **604**, this disclosure contemplates any suitable edges **606** with any suitable attributes connecting user nodes **602** and concept nodes **604**. Moreover, although this disclosure describes edges between a user node **602** and a concept node **604** representing a single relationship, this disclosure contemplates edges between a user node **602** and a concept node **604** representing one or more relationships. As an example and not by way of limitation, an edge **606** may represent both that a user likes and has used at a particular concept. Alternatively, another edge **606** may represent each type of relationship (or multiples of a single relationship) between a user node **602** and a concept node **604** (as illustrated in FIG. **6** between user node **602** for user "E" and concept node **604** for "SPOTIFY").

[0066] In particular embodiments, social-networking system **560** may create an edge **606** between a user node **602** and a concept node **604** in social graph **600**. As an example and not by way of limitation, a user viewing a concept-profile page (such as, for example, by using a web browser or a special-purpose application hosted by the user's client system **530**) may indicate that he or she likes the concept represented by the concept node **604** by clicking or selecting a "Like" icon, which may cause the user's client system **530** to send to social-networking system **560** a message indicating the user's liking of the concept associated with the concept-profile page. In response to the message, social-networking system **560** may create an edge **606** between user node **602** associated with the user and concept node **604**, as illustrated by "like" edge **606** between the user and concept node **604**. In particular embodiments, social-networking system **560** may store an edge **606** in one or more data stores. In particular embodiments, an edge **606** may be automatically formed by social-networking system **560** in response to a particular user action. As an example and not by way of limitation, if a first user uploads a picture, watches a movie, or listens to a song, an edge **606** may be formed between user node **602** corresponding to the first user and concept nodes **604** corresponding to those concepts. Although this disclosure describes forming particular edges **606** in particular manners, this disclosure contemplates forming any suitable edges **606** in any suitable manner.

Social Graph Affinity and Coefficient

[0067] In particular embodiments, social-networking system **560** may determine the social-graph affinity (which may be referred to herein as "affinity") of various social-graph entities for each other. Affinity may represent the strength of a relationship or level of interest between particular objects associated with the online social network, such as users, concepts, content, actions, advertisements, other objects

associated with the online social network, or any suitable combination thereof. Affinity may also be determined with respect to objects associated with third-party systems **570** or other suitable systems. An overall affinity for a social-graph entity for each user, subject matter, or type of content may be established. The overall affinity may change based on continued monitoring of the actions or relationships associated with the social-graph entity. Although this disclosure describes determining particular affinities in a particular manner, this disclosure contemplates determining any suitable affinities in any suitable manner.

[0068] In particular embodiments, social-networking system **560** may measure or quantify social-graph affinity using an affinity coefficient (which may be referred to herein as "coefficient"). The coefficient may represent or quantify the strength of a relationship between particular objects associated with the online social network. The coefficient may also represent a probability or function that measures a predicted probability that a user will perform a particular action based on the user's interest in the action. In this way, a user's future actions may be predicted based on the user's prior actions, where the coefficient may be calculated at least in part on the history of the user's actions. Coefficients may be used to predict any number of actions, which may be within or outside of the online social network. As an example and not by way of limitation, these actions may include various types of communications, such as sending messages, posting content, or commenting on content; various types of observation actions, such as accessing or viewing profile pages, media, or other suitable content; various types of coincidence information about two or more social-graph entities, such as being in the same group, tagged in the same photograph, checked-in at the same location, or attending the same event; or other suitable actions. Although this disclosure describes measuring affinity in a particular manner, this disclosure contemplates measuring affinity in any suitable manner.

[0069] In particular embodiments, social-networking system **560** may use a variety of factors to calculate a coefficient. These factors may include, for example, user actions, types of relationships between objects, location information, other suitable factors, or any combination thereof. In particular embodiments, different factors may be weighted differently when calculating the coefficient. The weights for each factor may be static or the weights may change according to, for example, the user, the type of relationship, the type of action, the user's location, and so forth. Ratings for the factors may be combined according to their weights to determine an overall coefficient for the user. As an example and not by way of limitation, particular user actions may be assigned both a rating and a weight while a relationship associated with the particular user action is assigned a rating and a correlating weight (e.g., so the weights total 100%). To calculate the coefficient of a user towards a particular object, the rating assigned to the user's actions may comprise, for example, 60% of the overall coefficient, while the relationship between the user and the object may comprise 40% of the overall coefficient. In particular embodiments, the social-networking system **560** may consider a variety of variables when determining weights for various factors used to calculate a coefficient, such as, for example, the time since information was accessed, decay factors, frequency of access, relationship to information or relationship to the object about which information was accessed, relationship to social-graph entities connected to the object, short- or long-term averages of user actions, user feedback, other suitable variables, or any combination thereof. As an example and not by way of limitation, a coefficient may include a decay factor that causes the strength of the signal provided by particular actions to decay with time, such that more recent actions are more relevant when calculating the coefficient. The ratings and weights may be continuously updated based on continued tracking of the actions upon which the coefficient is based. Any type of process or algorithm may be employed for assigning, combining, averaging, and so forth the ratings for each factor and the weights assigned to the factors. In particular embodiments, social-networking system **560** may determine coefficients using machine-learning algorithms trained on historical actions and past user responses, or data farmed from users by exposing them to various options and measuring responses. Although this disclosure describes calculating coefficients in a particular manner, this disclosure contemplates calculating coefficients in any suitable manner.

[0070] In particular embodiments, social-networking system **560** may calculate a coefficient based on a user's actions. Social-networking system **560** may monitor such actions on the online social network, on a third-party system **570**, on other suitable systems, or any combination thereof. Any suitable type of user actions may be tracked or monitored. Typical user actions include viewing profile pages, creating or posting content, interacting with content, tagging or being tagged in images, joining groups, listing and confirming attendance at events, checking-in at locations, liking particular pages, creating pages, and performing other tasks that facilitate social action. In particular embodiments, social-networking system **560** may calculate a coefficient based on the user's actions with particular types of content. The content may be associated with the online social network, a third-party system **570**, or another suitable system. The content may include users, profile pages, posts, news stories, headlines, instant messages, chat room conversations, emails, advertisements, pictures, video, music, other suitable objects, or any combination thereof. Social-networking system **560** may analyze a user's actions to determine whether one or more of the actions indicate an affinity for subject matter, content, other users, and so forth. As an example and not by way of limitation, if a user frequently posts content related to "coffee" or variants thereof, social-networking system **560** may determine the user has a high coefficient with respect to the concept "coffee". Particular actions or types of actions may be assigned a higher weight and/or rating than other actions, which may affect the overall calculated coefficient. As an example and not by way of limitation, if a first user emails a second user, the weight or the rating for the action may be higher than if the first user simply views the user-profile page for the second user.

[0071] In particular embodiments, social-networking system **560** may calculate a coefficient based on the type of relationship between particular objects. Referencing the social graph **600**, social-networking system **560** may analyze the number and/or type of edges **606** connecting particular user nodes **602** and concept nodes **604** when calculating a coefficient. As an example and not by way of limitation, user nodes **602** that are connected by a spouse-type edge (representing that the two users are married) may be assigned a higher coefficient than a user nodes **602** that are connected by a friend-type edge. In other words, depend-

ing upon the weights assigned to the actions and relationships for the particular user, the overall affinity may be determined to be higher for content about the user's spouse than for content about the user's friend. In particular embodiments, the relationships a user has with another object may affect the weights and/or the ratings of the user's actions with respect to calculating the coefficient for that object. As an example and not by way of limitation, if a user is tagged in a first photo, but merely likes a second photo, social-networking system **560** may determine that the user has a higher coefficient with respect to the first photo than the second photo because having a tagged-in-type relationship with content may be assigned a higher weight and/or rating than having a like-type relationship with content. In particular embodiments, social-networking system **560** may calculate a coefficient for a first user based on the relationship one or more second users have with a particular object. In other words, the connections and coefficients other users have with an object may affect the first user's coefficient for the object. As an example and not by way of limitation, if a first user is connected to or has a high coefficient for one or more second users, and those second users are connected to or have a high coefficient for a particular object, social-networking system **560** may determine that the first user should also have a relatively high coefficient for the particular object. In particular embodiments, the coefficient may be based on the degree of separation between particular objects. The degree of separation between two objects represented by two nodes, respectively, is a count of edges in a shortest path connecting the two nodes in the social graph **600**. As an example and not by way of limitation, in the social graph **600**, the user node **602** of user "C" is connected to the user node **602** of user "A" via multiple paths including, for example, a first path directly passing through the user node **602** of user "B," a second path passing through the concept node **604** of company "Acme" and the user node **602** of user "D," and a third path passing through the user nodes **602** and concept nodes **604** representing school "Stanford," user "G," company "Acme," and user "D." User "C" and user "A" have a degree of separation of two because the shortest path connecting their corresponding nodes (i.e., the first path) includes two edges **606**. The lower coefficient may represent the decreasing likelihood that the first user will share an interest in content objects of the user that is indirectly connected to the first user in the social graph **600**. As an example and not by way of limitation, social-graph entities that are closer in the social graph **600** (i.e., fewer degrees of separation) may have a higher coefficient than entities that are further apart in the social graph **600**.

[0072] In particular embodiments, social-networking system **560** may calculate a coefficient based on location information. Objects that are geographically closer to each other may be considered to be more related or of more interest to each other than more distant objects. In particular embodiments, the coefficient of a user towards a particular object may be based on the proximity of the object's location to a current location associated with the user (or the location of a client system **530** of the user). A first user may be more interested in other users or concepts that are closer to the first user. As an example and not by way of limitation, if a user is one mile from an airport and two miles from a gas station, social-networking system **560** may determine that the user has a higher coefficient for the airport than the gas station based on the proximity of the airport to the user.

[0073] In particular embodiments, social-networking system **560** may perform particular actions with respect to a user based on coefficient information. Coefficients may be used to predict whether a user will perform a particular action based on the user's interest in the action. A coefficient may be used when generating or presenting any type of objects to a user, such as advertisements, search results, news stories, media, messages, notifications, or other suitable objects. The coefficient may also be utilized to rank and order such objects, as appropriate. In this way, social-networking system **560** may provide information that is relevant to user's interests and current circumstances, increasing the likelihood that they will find such information of interest. In particular embodiments, social-networking system **560** may generate content based on coefficient information. Content objects may be provided or selected based on coefficients specific to a user. As an example and not by way of limitation, the coefficient may be used to generate media for the user, where the user may be presented with media for which the user has a high overall coefficient with respect to the media object. As another example and not by way of limitation, the coefficient may be used to generate advertisements for the user, where the user may be presented with advertisements for which the user has a high overall coefficient with respect to the advertised object. In particular embodiments, social-networking system **560** may generate search results based on coefficient information. Search results for a particular user may be scored or ranked based on the coefficient associated with the search results with respect to the querying user. As an example and not by way of limitation, search results corresponding to objects with higher coefficients may be ranked higher on a search-results page than results corresponding to objects having lower coefficients.

[0074] In particular embodiments, social-networking system **560** may calculate a coefficient in response to a request for a coefficient from a particular system or process. To predict the likely actions a user may take (or may be the subject of) in a given situation, any process may request a calculated coefficient for a user. The request may also include a set of weights to use for various factors used to calculate the coefficient. This request may come from a process running on the online social network, from a third-party system **570** (e.g., via an API or other communication channel), or from another suitable system. In response to the request, social-networking system **560** may calculate the coefficient (or access the coefficient information if it has previously been calculated and stored). In particular embodiments, social-networking system **560** may measure an affinity with respect to a particular process. Different processes (both internal and external to the online social network) may request a coefficient for a particular object or set of objects. Social-networking system **560** may provide a measure of affinity that is relevant to the particular process that requested the measure of affinity. In this way, each process receives a measure of affinity that is tailored for the different context in which the process will use the measure of affinity.

[0075] In connection with social-graph affinity and affinity coefficients, particular embodiments may utilize one or more systems, components, elements, functions, methods, operations, or steps disclosed in U.S. patent application Ser. No.

11/503093, filed 11 Aug. 2006, U.S. patent application Ser. No. 12/977027, filed 22 Dec. 2010, U.S. p;atent application Ser. No. 12/978265, filed 23 Dec. 2010, and U.S. patent application Ser. No. 13/632869, filed 1 Oct. 2012, each of which is incorporated by reference.

Privacy

[0076] In particular embodiments, one or more of the content objects of the online social network may be associated with a privacy setting. The privacy settings (or "access settings") for an object may be stored in any suitable manner, such as, for example, in association with the object, in an index on an authorization server, in another suitable manner, or any combination thereof. A privacy setting of an object may specify how the object (or particular information associated with an object) can be accessed (e.g., viewed or shared) using the online social network. Where the privacy settings for an object allow a particular user to access that object, the object may be described as being "visible" with respect to that user. As an example and not by way of limitation, a user of the online social network may specify privacy settings for a user-profile page that identify a set of users that may access the work experience information on the user-profile page, thus excluding other users from accessing the information. In particular embodiments, the privacy settings may specify a "blocked list" of users that should not be allowed to access certain information associated with the object. In other words, the blocked list may specify one or more users or entities for which an object is not visible. As an example and not by way of limitation, a user may specify a set of users that may not access photos albums associated with the user, thus excluding those users from accessing the photo albums (while also possibly allowing certain users not within the set of users to access the photo albums). In particular embodiments, privacy settings may be associated with particular social-graph elements. Privacy settings of a social-graph element, such as a node or an edge, may specify how the social-graph element, information associated with the social-graph element, or content objects associated with the social-graph element can be accessed using the online social network. As an example and not by way of limitation, a particular concept node **604** corresponding to a particular photo may have a privacy setting specifying that the photo may only be accessed by users tagged in the photo and their friends. In particular embodiments, privacy settings may allow users to opt in or opt out of having their actions logged by social-networking system **560** or shared with other systems (e.g., third-party system **570**). In particular embodiments, the privacy settings associated with an object may specify any suitable granularity of permitted access or denial of access. As an example and not by way of limitation, access or denial of access may be specified for particular users (e.g., only me, my roommates, and my boss), users within a particular degrees-of-separation (e.g., friends, or friends-of-friends), user groups (e.g., the gaming club, my family), user networks (e.g., employees of particular employers, students or alumni of particular university), all users ("public"), no users ("private"), users of third-party systems **570**, particular applications (e.g., third-party applications, external websites), other suitable users or entities, or any combination thereof. Although this disclosure describes using particular privacy settings in a particular manner, this disclosure contemplates using any suitable privacy settings in any suitable manner.

[0077] In particular embodiments, one or more servers **562** may be authorization/privacy servers for enforcing privacy settings. In response to a request from a user (or other entity) for a particular object stored in a data store **564**, social-networking system **560** may send a request to the data store **564** for the object. The request may identify the user associated with the request and may only be sent to the user (or a client system **530** of the user) if the authorization server determines that the user is authorized to access the object based on the privacy settings associated with the object. If the requesting user is not authorized to access the object, the authorization server may prevent the requested object from being retrieved from the data store **564**, or may prevent the requested object from being sent to the user. In the search query context, an object may only be generated as a search result if the querying user is authorized to access the object. In other words, the object must have a visibility that is visible to the querying user. If the object has a visibility that is not visible to the user, the object may be excluded from the search results. Although this disclosure describes enforcing privacy settings in a particular manner, this disclosure contemplates enforcing privacy settings in any suitable manner.

Systems and Methods

[0078] FIG. **7** illustrates an example computer system **700**. In particular embodiments, one or more computer systems **700** perform one or more steps of one or more methods described or illustrated herein. In particular embodiments, one or more computer systems **700** provide functionality described or illustrated herein. In particular embodiments, software running on one or more computer systems **700** performs one or more steps of one or more methods described or illustrated herein or provides functionality described or illustrated herein. Particular embodiments include one or more portions of one or more computer systems **700**. Herein, reference to a computer system may encompass a computing device, and vice versa, where appropriate. Moreover, reference to a computer system may encompass one or more computer systems, where appropriate.

[0079] This disclosure contemplates any suitable number of computer systems **700**. This disclosure contemplates computer system **700** taking any suitable physical form. As example and not by way of limitation, computer system **700** may be an embedded computer system, a system-on-chip (SOC), a single-board computer system (SBC) (such as, for example, a computer-on-module (COM) or system-on-module (SOM)), a desktop computer system, a laptop or notebook computer system, an interactive kiosk, a mainframe, a mesh of computer systems, a mobile telephone, a personal digital assistant (PDA), a server, a tablet computer system, an augmented/virtual reality device, or a combination of two or more of these. Where appropriate, computer system **700** may include one or more computer systems **700**; be unitary or distributed; span multiple locations; span multiple machines; span multiple data centers; or reside in a cloud, which may include one or more cloud components in one or more networks. Where appropriate, one or more computer systems **700** may perform without substantial spatial or temporal limitation one or more steps of one or more methods described or illustrated herein. As an example and not by way of limitation, one or more computer systems **700** may perform in real time or in batch mode one or more steps

of one or more methods described or illustrated herein. One or more computer systems **700** may perform at different times or at different locations one or more steps of one or more methods described or illustrated herein, where appropriate.

[0080] In particular embodiments, computer system **700** includes a processor **702**, memory **704**, storage **706**, an input/output (I/O) interface **708**, a communication interface **710**, and a bus **712**. Although this disclosure describes and illustrates a particular computer system having a particular number of particular components in a particular arrangement, this disclosure contemplates any suitable computer system having any suitable number of any suitable components in any suitable arrangement.

[0081] In particular embodiments, processor **702** includes hardware for executing instructions, such as those making up a computer program. As an example and not by way of limitation, to execute instructions, processor **702** may retrieve (or fetch) the instructions from an internal register, an internal cache, memory **704**, or storage **706**; decode and execute them; and then write one or more results to an internal register, an internal cache, memory **704**, or storage **706**. In particular embodiments, processor **702** may include one or more internal caches for data, instructions, or addresses. This disclosure contemplates processor **702** including any suitable number of any suitable internal caches, where appropriate. As an example and not by way of limitation, processor **702** may include one or more instruction caches, one or more data caches, and one or more translation lookaside buffers (TLBs). Instructions in the instruction caches may be copies of instructions in memory **704** or storage **706**, and the instruction caches may speed up retrieval of those instructions by processor **702**. Data in the data caches may be copies of data in memory **704** or storage **706** for instructions executing at processor **702** to operate on; the results of previous instructions executed at processor **702** for access by subsequent instructions executing at processor **702** or for writing to memory **704** or storage **706**; or other suitable data. The data caches may speed up read or write operations by processor **702**. The TLBs may speed up virtual-address translation for processor **702**. In particular embodiments, processor **702** may include one or more internal registers for data, instructions, or addresses. This disclosure contemplates processor **702** including any suitable number of any suitable internal registers, where appropriate. Where appropriate, processor **702** may include one or more arithmetic logic units (ALUs); be a multi-core processor; or include one or more processors **702**. Although this disclosure describes and illustrates a particular processor, this disclosure contemplates any suitable processor.

[0082] In particular embodiments, memory **704** includes main memory for storing instructions for processor **702** to execute or data for processor **702** to operate on. As an example and not by way of limitation, computer system **700** may load instructions from storage **706** or another source (such as, for example, another computer system **700**) to memory **704**. Processor **702** may then load the instructions from memory **704** to an internal register or internal cache. To execute the instructions, processor **702** may retrieve the instructions from the internal register or internal cache and decode them. During or after execution of the instructions, processor **702** may write one or more results (which may be intermediate or final results) to the internal register or internal cache. Processor **702** may then write one or more of those results to memory **704**. In particular embodiments, processor **702** executes only instructions in one or more internal registers or internal caches or in memory **704** (as opposed to storage **706** or elsewhere) and operates only on data in one or more internal registers or internal caches or in memory **704** (as opposed to storage **706** or elsewhere). One or more memory buses (which may each include an address bus and a data bus) may couple processor **702** to memory **704**. Bus **712** may include one or more memory buses, as described below. In particular embodiments, one or more memory management units (MMUs) reside between processor **702** and memory **704** and facilitate accesses to memory **704** requested by processor **702**. In particular embodiments, memory **704** includes random access memory (RAM). This RAM may be volatile memory, where appropriate. Where appropriate, this RAM may be dynamic RAM (DRAM) or static RAM (SRAM). Moreover, where appropriate, this RAM may be single-ported or multi-ported RAM. This disclosure contemplates any suitable RAM. Memory **704** may include one or more memories **704**, where appropriate. Although this disclosure describes and illustrates particular memory, this disclosure contemplates any suitable memory.

[0083] In particular embodiments, storage **706** includes mass storage for data or instructions. As an example and not by way of limitation, storage **706** may include a hard disk drive (HDD), a floppy disk drive, flash memory, an optical disc, a magneto-optical disc, magnetic tape, or a Universal Serial Bus (USB) drive or a combination of two or more of these. Storage **706** may include removable or non-removable (or fixed) media, where appropriate. Storage **706** may be internal or external to computer system **700**, where appropriate. In particular embodiments, storage **706** is non-volatile, solid-state memory. In particular embodiments, storage **706** includes read-only memory (ROM). Where appropriate, this ROM may be mask-programmed ROM, programmable ROM (PROM), erasable PROM (EPROM), electrically erasable PROM (EEPROM), electrically alterable ROM (EAROM), or flash memory or a combination of two or more of these. This disclosure contemplates mass storage **706** taking any suitable physical form. Storage **706** may include one or more storage control units facilitating communication between processor **702** and storage **706**, where appropriate. Where appropriate, storage **706** may include one or more storages **706**. Although this disclosure describes and illustrates particular storage, this disclosure contemplates any suitable storage.

[0084] In particular embodiments, I/O interface **708** includes hardware, software, or both, providing one or more interfaces for communication between computer system **700** and one or more I/O devices. Computer system **700** may include one or more of these I/O devices, where appropriate. One or more of these I/O devices may enable communication between a person and computer system **700**. As an example and not by way of limitation, an I/O device may include a keyboard, keypad, microphone, monitor, mouse, printer, scanner, speaker, still camera, stylus, tablet, touch screen, trackball, video camera, another suitable I/O device or a combination of two or more of these. An I/O device may include one or more sensors. This disclosure contemplates any suitable I/O devices and any suitable I/O interfaces **708** for them. Where appropriate, I/O interface **708** may include one or more device or software drivers enabling processor **702** to drive one or more of these I/O devices. I/O interface **708** may include one or more I/O interfaces **708**, where

appropriate. Although this disclosure describes and illustrates a particular I/O interface, this disclosure contemplates any suitable I/O interface.

[0085] In particular embodiments, communication interface **710** includes hardware, software, or both providing one or more interfaces for communication (such as, for example, packet-based communication) between computer system **700** and one or more other computer systems **700** or one or more networks. As an example and not by way of limitation, communication interface **710** may include a network interface controller (NIC) or network adapter for communicating with an Ethernet or other wire-based network or a wireless NIC (WNIC) or wireless adapter for communicating with a wireless network, such as a WI-FI network. This disclosure contemplates any suitable network and any suitable communication interface **710** for it. As an example and not by way of limitation, computer system **700** may communicate with an ad hoc network, a personal area network (PAN), a local area network (LAN), a wide area network (WAN), a metropolitan area network (MAN), or one or more portions of the Internet or a combination of two or more of these. One or more portions of one or more of these networks may be wired or wireless. As an example, computer system **700** may communicate with a wireless PAN (WPAN) (such as, for example, a BLUETOOTH WPAN), a WI-FI network, a WI-MAX network, a cellular telephone network (such as, for example, a Global System for Mobile Communications (GSM) network), or other suitable wireless network or a combination of two or more of these. Computer system **700** may include any suitable communication interface **710** for any of these networks, where appropriate. Communication interface **710** may include one or more communication interfaces **710**, where appropriate. Although this disclosure describes and illustrates a particular communication interface, this disclosure contemplates any suitable communication interface.

[0086] In particular embodiments, bus **712** includes hardware, software, or both coupling components of computer system **700** to each other. As an example and not by way of limitation, bus **712** may include an Accelerated Graphics Port (AGP) or other graphics bus, an Enhanced Industry Standard Architecture (EISA) bus, a front-side bus (FSB), a HYPERTRANSPORT (HT) interconnect, an Industry Standard Architecture (ISA) bus, an INFINIBAND interconnect, a low-pin-count (LPC) bus, a memory bus, a Micro Channel Architecture (MCA) bus, a Peripheral Component Interconnect (PCI) bus, a PCI-Express (PCIe) bus, a serial advanced technology attachment (SATA) bus, a Video Electronics Standards Association local (VLB) bus, or another suitable bus or a combination of two or more of these. Bus **712** may include one or more buses **712**, where appropriate. Although this disclosure describes and illustrates a particular bus, this disclosure contemplates any suitable bus or interconnect.

[0087] Herein, a computer-readable non-transitory storage medium or media may include one or more semiconductor-based or other integrated circuits (ICs) (such, as for example, field-programmable gate arrays (FPGAs) or application-specific ICs (ASICs)), hard disk drives (HDDs), hybrid hard drives (HHDs), optical discs, optical disc drives (ODDs), magneto-optical discs, magneto-optical drives, floppy diskettes, floppy disk drives (FDDs), magnetic tapes, solid-state drives (SSDs), RAM-drives, SECURE DIGITAL cards or drives, any other suitable computer-readable non-transitory storage media, or any suitable combination of two or more of these, where appropriate. A computer-readable non-transitory storage medium may be volatile, non-volatile, or a combination of volatile and non-volatile, where appropriate.

[0088] Herein, "or" is inclusive and not exclusive, unless expressly indicated otherwise or indicated otherwise by context. Therefore, herein, "A or B" means "A, B, or both," unless expressly indicated otherwise or indicated otherwise by context. Moreover, "and" is both joint and several, unless expressly indicated otherwise or indicated otherwise by context. Therefore, herein, "A and B" means "A and B, jointly or severally," unless expressly indicated otherwise or indicated otherwise by context.

[0089] The scope of this disclosure encompasses all changes, substitutions, variations, alterations, and modifications to the example embodiments described or illustrated herein that a person having ordinary skill in the art would comprehend. The scope of this disclosure is not limited to the example embodiments described or illustrated herein. Moreover, although this disclosure describes and illustrates respective embodiments herein as including particular components, elements, feature, functions, operations, or steps, any of these embodiments may include any combination or permutation of any of the components, elements, features, functions, operations, or steps described or illustrated anywhere herein that a person having ordinary skill in the art would comprehend. Furthermore, reference in the appended claims to an apparatus or system or a component of an apparatus or system being adapted to, arranged to, capable of, configured to, enabled to, operable to, or operative to perform a particular function encompasses that apparatus, system, component, whether or not it or that particular function is activated, turned on, or unlocked, as long as that apparatus, system, or component is so adapted, arranged, capable, configured, enabled, operable, or operative. Additionally, although this disclosure describes or illustrates particular embodiments as providing particular advantages, particular embodiments may provide none, some, or all of these advantages.

What is claimed is:

1. A method comprising, by one or more computing systems of an online social network:

identifying, by the one or more computing systems, a plurality of users of the online social network based on one or more affinity coefficients between the users and a geographical location associated with each of the users;

sending, by the one or more computing systems, a message corresponding to an activity recommendation to each of the users, wherein the message comprises:

identification information of one or more of the other users of the plurality of users, and

a prompt for a response from the receiving user indicating whether the receiving user is interested in the recommended activity;

receiving, by the one or more computing systems, one or more responses to the message from one or more users of the plurality of users, respectively, wherein each response indicates whether the respective user is interested in the recommended activity; and

responsive to receiving the one or more responses, by the one or more computing systems:

if the response from each of at least two of the users indicates an interest in the recommended activity,

then sending a notification to each of the users who indicated an interest in the recommended activity identifying the other users who also indicated an interest in the recommended activity,

else, deactivating the activity recommendation.

2. The method of claim **1**, wherein identifying the plurality of users is based at least in part on proximity among one or more of the geographical locations associated with one or more of the users, respectively.

3. The method of claim **1**, wherein each of the identified users is within a particular degree of separation within a social graph of the online social network from each of the other identified users.

4. The method of claim **1**, wherein the affinity coefficient between a given pair of users is based at least in part on one or more of:

a degree of separation between the users in a social graph of the online social network;

a commonality between the users;

a social-interaction history between the users; or

demographic information of the users.

5. The method of claim **1**, wherein identifying the plurality of users is further based on one or more selection rules.

6. The method of claim **5**, wherein at least one of the selection rules specifies that identifying one or more of the users is based on a condition that the one or more of the users are not identified for a different activity recommendation within a specified time period.

7. The method of claim **1**, wherein the message comprises one or more of:

a time period associated with the activity recommendation;

a geographical location associated with the activity recommendation; or

a description of the recommended activity.

8. The method of claim **1**, wherein the activity recommendation is generated based on a common interest associated with one or more of the identified users, the common interest being determined based on one or more user profiles associated with the one or more of the identified users, respectively.

9. The method of claim **1**, further comprising:

accessing a social graph comprising a plurality of nodes and a plurality of edges connecting the nodes, each of the edges between two of the nodes representing a single degree of separation between them, the nodes comprising:

a plurality of first nodes corresponding to the plurality of users; and

a plurality of second nodes corresponding to a plurality of objects associated with the online social network, respectively;

wherein the message further comprises a reference to an object of the plurality of objects, the object being associated with the activity recommendation, wherein the second node corresponding to the referenced object is connected to one or more of the first nodes by one or more of the edges, respectively.

10. The method of claim **1**, wherein sending the message is performed as part of an activity-recommendation process of the online social network, wherein the activity-recommendation process sends messages corresponding to activity recommendations at a pre-determined frequency.

11. The method of claim **1**, wherein the activity recommendation is associated with an expiry date, and wherein the method further comprises deactivating the activity recommendation when the expiry date has passed.

12. The method of claim **1**, wherein sending the notification comprises initiating a message thread including each of the users who indicated an interest in the recommended activity.

13. The method of claim **1**, wherein if the response from each of at least two of the users indicates an interest in the recommended activity, then the method further comprises:

identifying one or more additional users of the online social network, wherein the additional users are identified based on social-networking information associated with the at least two of the users;

sending the message corresponding to the activity recommendation to each of the additional users;

receiving one or more responses to the message from one or more users of the additional users, respectively, wherein each response indicates that the respective additional user is interested in the recommended activity; and

sending an additional notification to each of the users who indicated an interest in the recommended activity identifying the other users who also indicated an interest in the recommended activity.

14. The method of claim **1**, further comprising:

generating the activity recommendation based on one or more of:

one or more prior activities associated with one or more users of the plurality of users;

one or more responses to one or more prior messages corresponding to activity recommendations received from one or more users of the plurality of users; or

one or more upcoming events associated with one or more users of the plurality of users.

15. The method of claim **1**, further comprising, for a first user of the plurality of users:

recording one or more responses by the first user to one or more prior messages corresponding to activity recommendations;

identifying one or more second users identified in the prior messages; and

compiling a list of users of interest to the first user, the list comprising one or more of the second users.

16. The method of claim **1**, wherein the plurality of users comprise:

a first user; and

one or more second users identified in a list of users of interest to the first user received from the first user.

17. The method of claim **1**, further comprising, for each user of the plurality of users:

accessing one or more privacy settings associated with the user; and

determining, based on the privacy settings and prior to sending the message, that the geographical location of the user is visible to each of the other users of the plurality of users.

18. The method of claim **1**, further comprising, for each user of the plurality of users:

accessing one or more privacy settings associated with the user; and

verifying, based on the privacy settings and prior to sending the message, that information associated with

the user in the message is visible to each of the other users of the plurality of users.

19. One or more computer-readable non-transitory storage media embodying software that is operable when executed to:

identify a plurality of users of an online social network based on one or more affinity coefficients between the users and a geographical location associated with each of the users;

send a message corresponding to an activity recommendation to each of the users, wherein the message comprises:

identification information of one or more of the other users of the plurality of users, and

a prompt for a response from the receiving user indicating whether the receiving user is interested in the recommended activity;

receive one or more responses to the message from one or more users of the plurality of users, respectively, wherein each response indicates whether the corresponding user is interested in the recommended activity; and

responsive to receiving the one or more responses:

if the response from each of at least two of the users indicates an interest in the recommended activity, then send a notification to each of the users who indicated an interest in the recommended activity identifying the other users who also indicated an interest in the recommended activity,

else, deactivate the activity recommendation.

20. A system comprising: one or more processors; and one or more computer-readable non-transitory storage media coupled to one or more of the processors and comprising instructions operable when executed by one or more of the processors to cause the system to:

identify a plurality of users of an online social network based on one or more affinity coefficients between the users and a geographical location associated with each of the users;

send a message corresponding to an activity recommendation to each of the users, wherein the message comprises:

identification information of one or more of the other users of the plurality of users, and

a prompt for a response from the receiving user indicating whether the receiving user is interested in the recommended activity;

receive one or more responses to the message from one or more users of the plurality of users, respectively, wherein each response indicates whether the corresponding user is interested in the recommended activity; and

responsive to receiving the one or more responses:

if the response from each of at least two of the users indicates an interest in the recommended activity, then send a notification to each of the users who indicated an interest in the recommended activity identifying the other users who also indicated an interest in the recommended activity,

else, deactivate the activity recommendation.

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