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(54) TECHNIQUE FOR EFFECTIVELY COLLECTING AND ANALYZING DATA IN PROVIDING INFORMATION ASSISTANCE SERVICES

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(57) **ABSTRACT**

In an information/call center where calls are received, requesting information concerning entities, goods and services, directions to a given destination, etc., data is collected in processing such calls. In accordance with the invention, the collected data is analyzed to generate dynamic data to supplement and/or improve the traditional databases, typically searched by an operator for responses to the information requests. In providing a public information assistance service, such dynamic data may concern, e.g., the most popular movies, restaurants, requested categories, etc. In providing a personalized information assistance service, such dynamic data may concern, e.g., previous telephone connections made for a subscriber, the most popular telephone connections requested by a subscriber, etc. In addition, based on the past search behavior, "fuzzy" logic is developed for correlating between search terms. When one search term is used in a search, the correlated search term may be suggested for adoption, in accordance with the fuzzy logic.

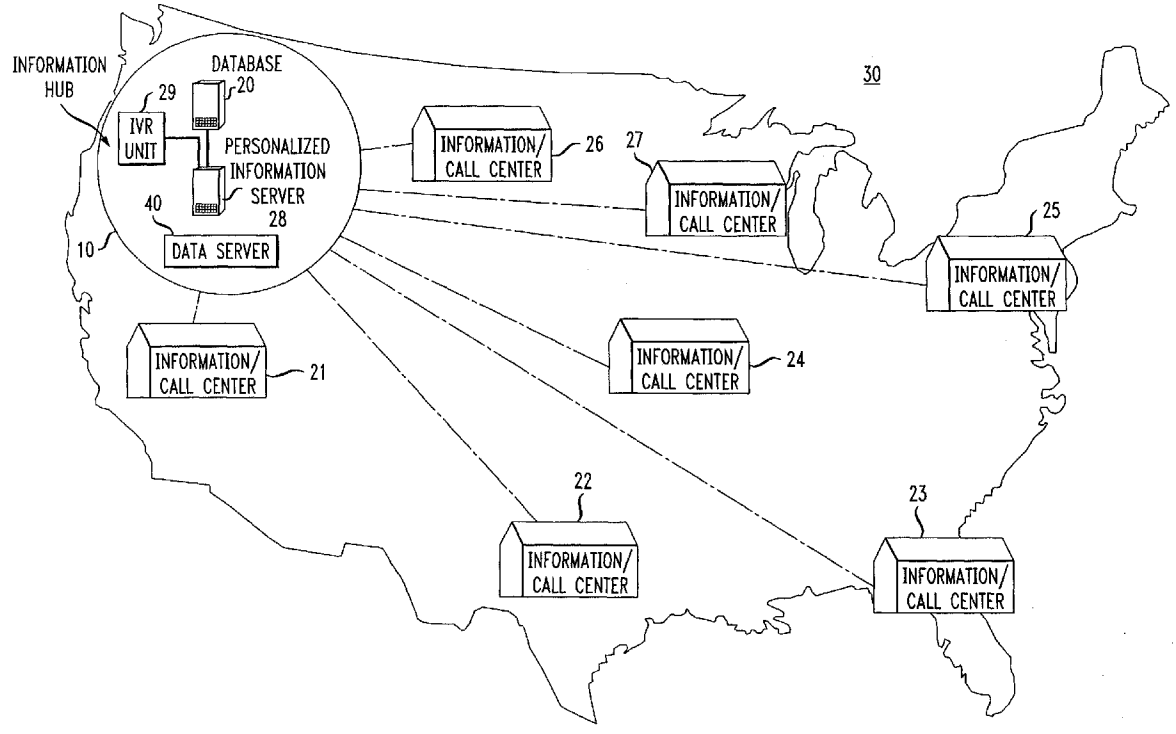
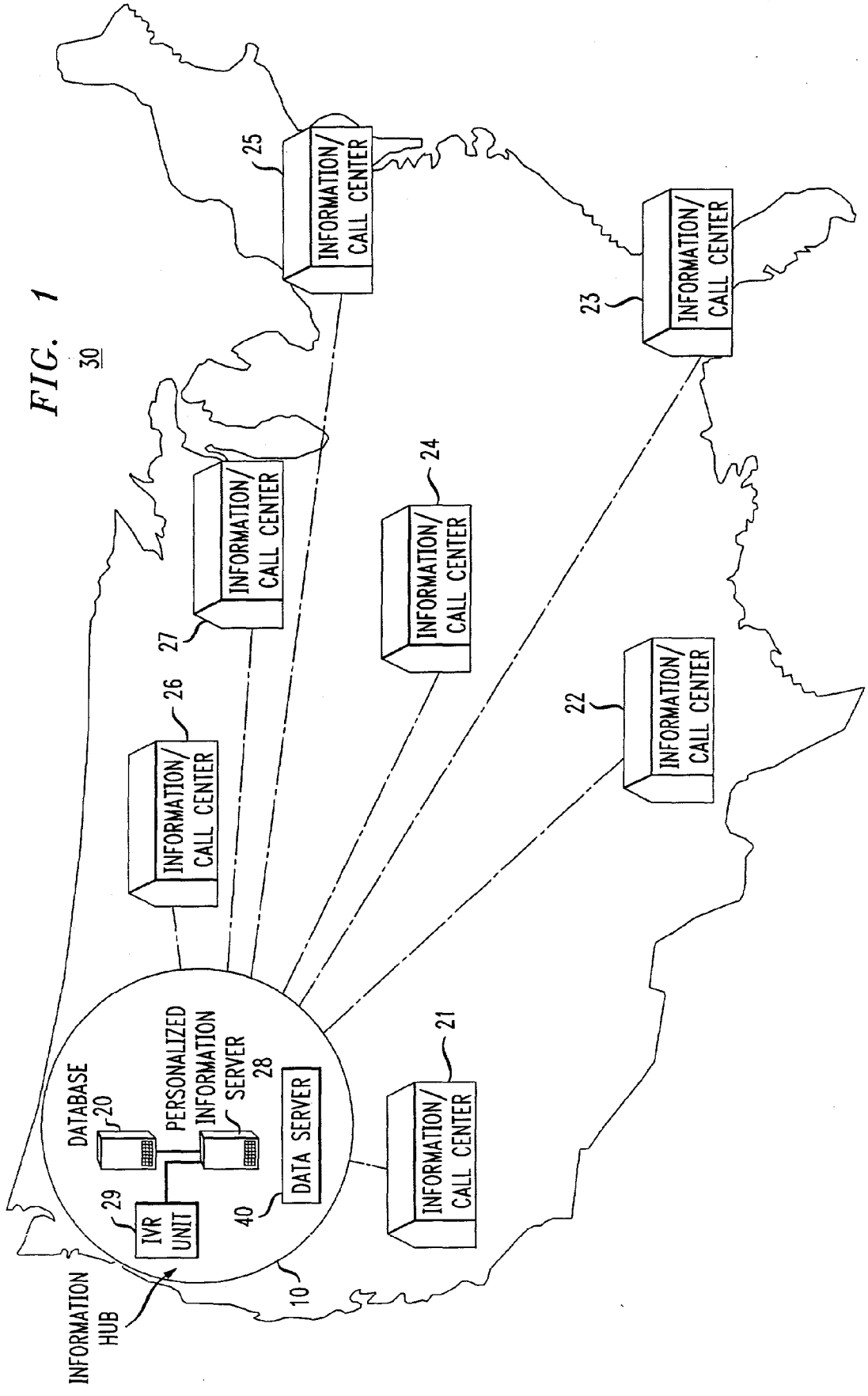


FIG. 1


30
INFORMATION/ CALL CENTER
25
INFORMATION/ CALL CENTER
23
INFORMATION/ CALL CENTER
24
INFORMATION/ CALL CENTER
27
INFORMATION/ CALL CENTER
26
INFORMATION/ CALL CENTER
22
INFORMATION/ CALL CENTER
21
DATABASE
20
PERSONALIZED INFORMATION SERVER
28
DATA SERVER
29
IVR UNIT
40
INFORMATION HUB
10

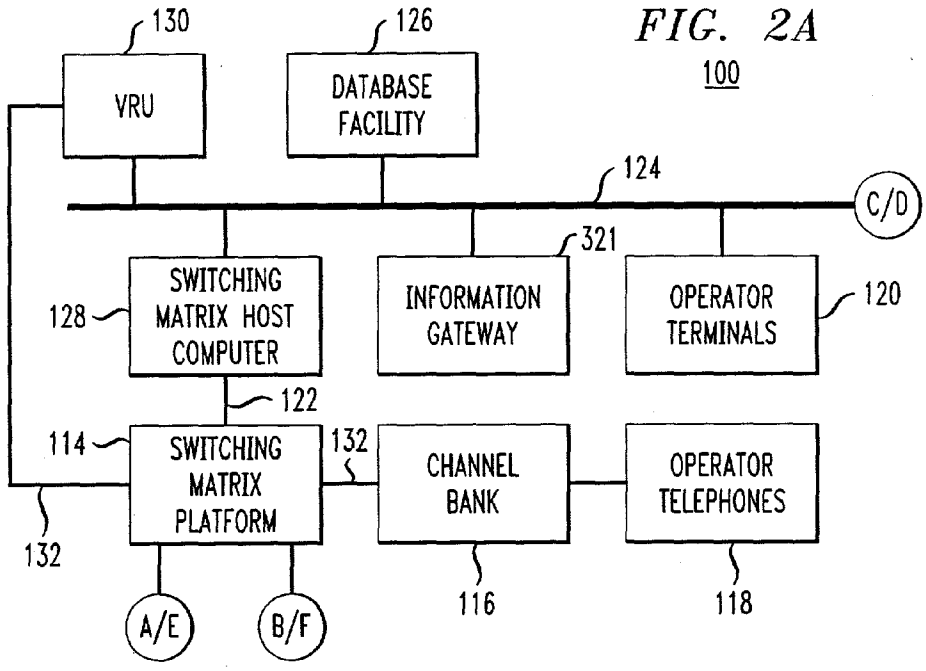


FIG. 2A

100

FIG. 2B

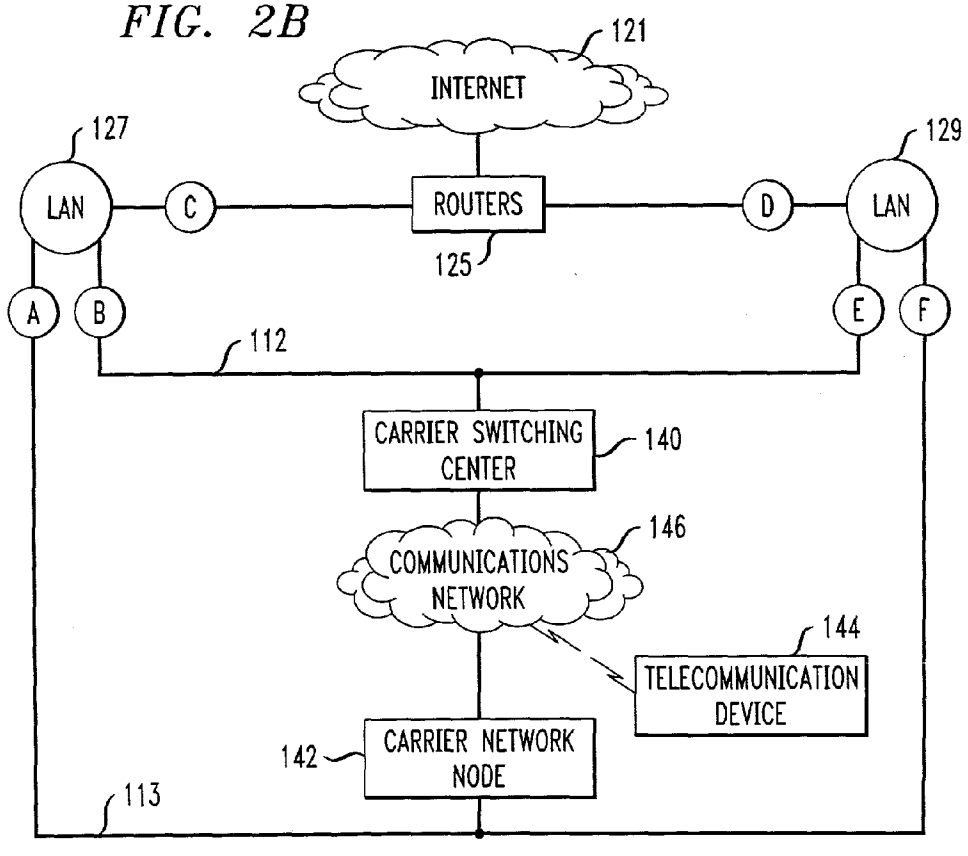


FIG. 3

200

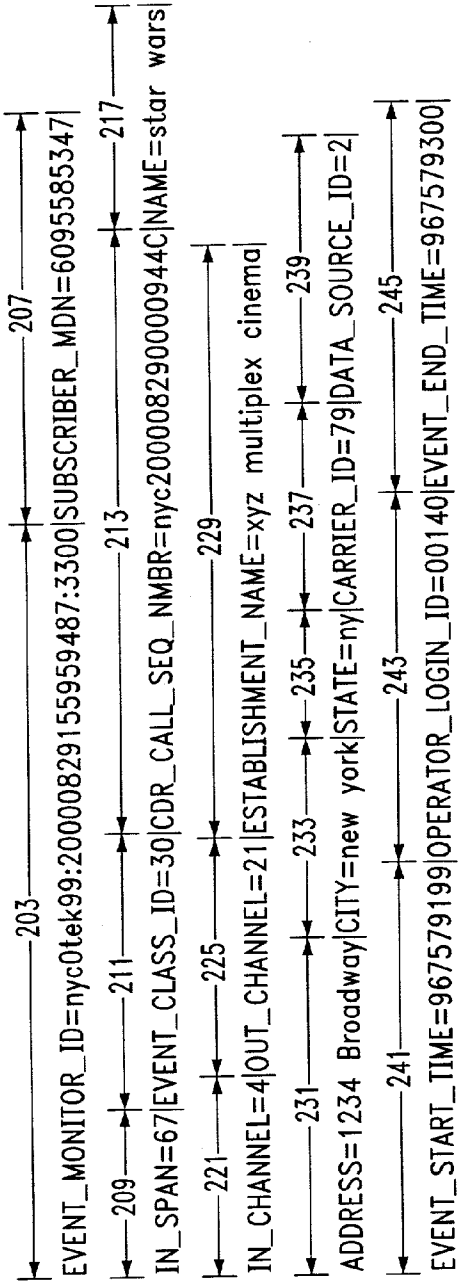


FIG. 4

40

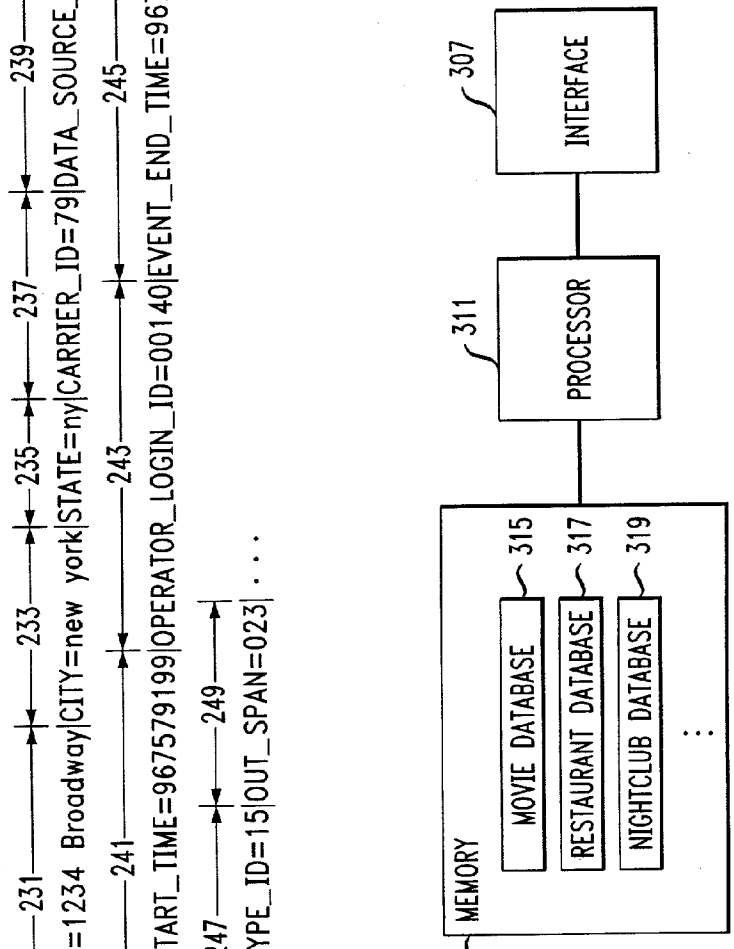


FIG. 5

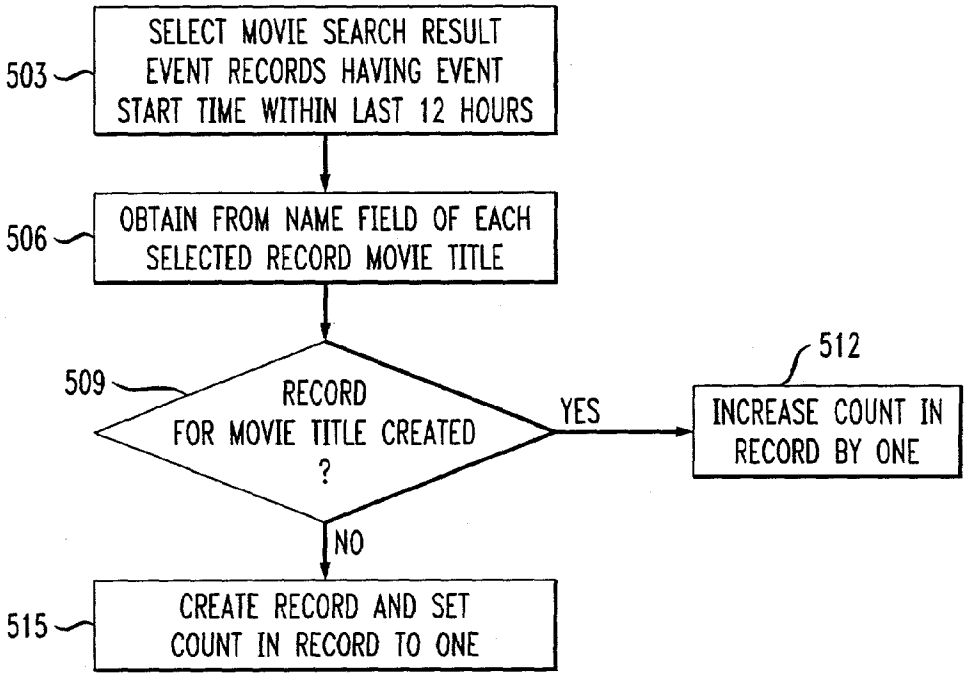

SELECT MOVIE SEARCH RESULT EVENT RECORDS HAVING EVENT START TIME WITHIN LAST 12 HOURS
503
OBTAIN FROM NAME FIELD OF EACH SELECTED RECORD MOVIE TITLE
506
RECORD FOR MOVIE TITLE CREATED ?
509
YES
INCREASE COUNT IN RECORD BY ONE
512
NO
CREATE RECORD AND SET COUNT IN RECORD TO ONE
515

FIG. 6

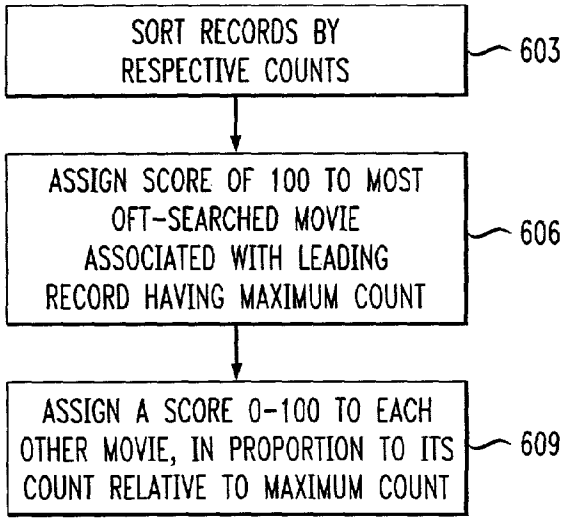

SORT RECORDS BY RESPECTIVE COUNTS
603
ASSIGN SCORE OF 100 TO MOST OFT-SEARCHED MOVIE ASSOCIATED WITH LEADING RECORD HAVING MAXIMUM COUNT
606
ASSIGN A SCORE 0-100 TO EACH OTHER MOVIE, IN PROPORTION TO ITS COUNT RELATIVE TO MAXIMUM COUNT
609

FIG. 7

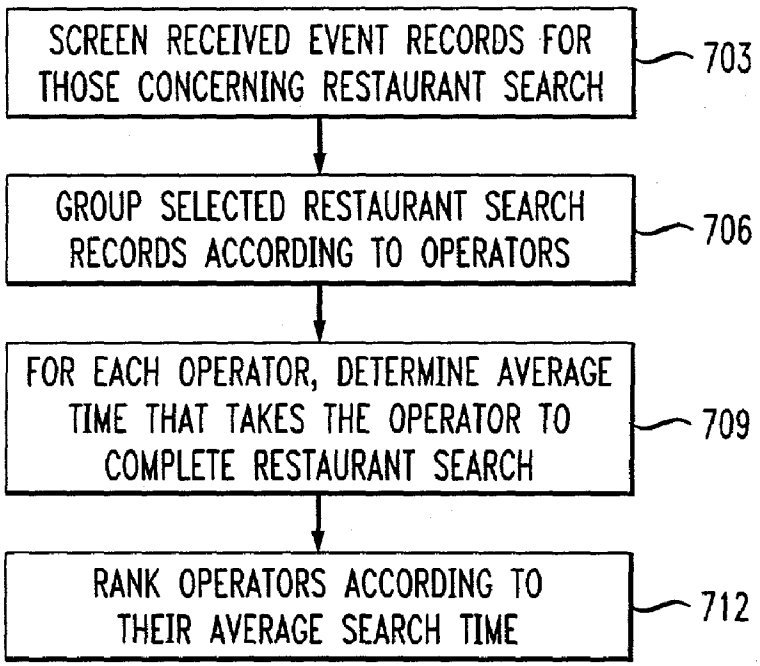
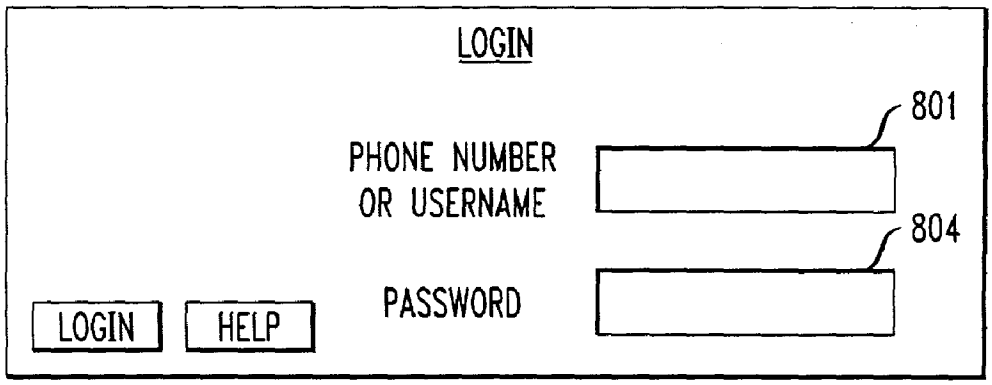

SCREEN RECEIVED EVENT RECORDS FOR THOSE CONCERNING RESTAURANT SEARCH
703
GROUP SELECTED RESTAURANT SEARCH RECORDS ACCORDING TO OPERATORS
706
FOR EACH OPERATOR, DETERMINE AVERAGE TIME THAT TAKES THE OPERATOR TO COMPLETE RESTAURANT SEARCH
709
RANK OPERATORS ACCORDING TO THEIR AVERAGE SEARCH TIME
712

FIG. 8


LOGIN
801
PHONE NUMBER OR USERNAME
804
PASSWORD
LOGIN
HELP

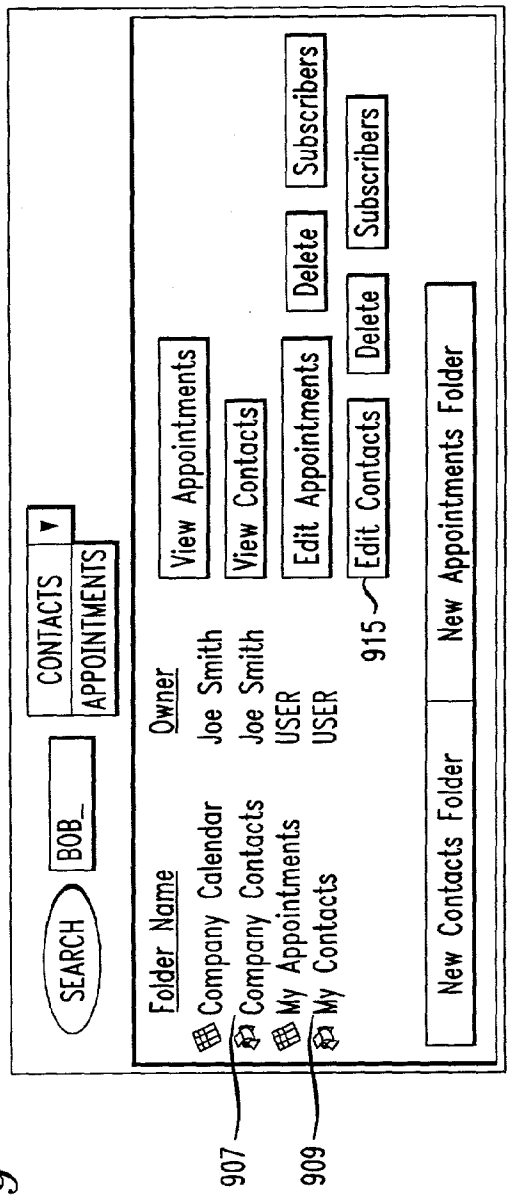

SEARCH
BOB_
CONTACTS
APPOINTMENTS
Folder Name
Owner
Company Calendar
Joe Smith
View Appointments
Company Contacts
Joe Smith
View Contacts
My Appointments
USER
Edit Appointments
Delete
Subscribers
My Contacts
USER
Edit Contacts
Delete
Subscribers
915
907
909
New Contacts Folder
New Appointments Folder

FIG. 9

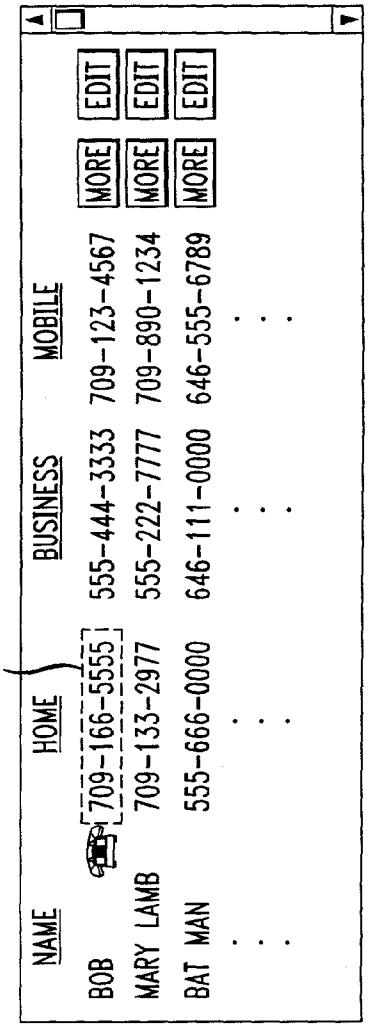

1005
NAME
HOME
BUSINESS
MOBILE
BOB
709-166-5555
555-444-3333
709-123-4567
MORE
EDIT
MARY LAMB
709-133-2977
555-222-7777
709-890-1234
MORE
EDIT
BAT MAN
555-666-0000
646-111-0000
646-555-6789
MORE
EDIT

FIG. 10

FIG. 11

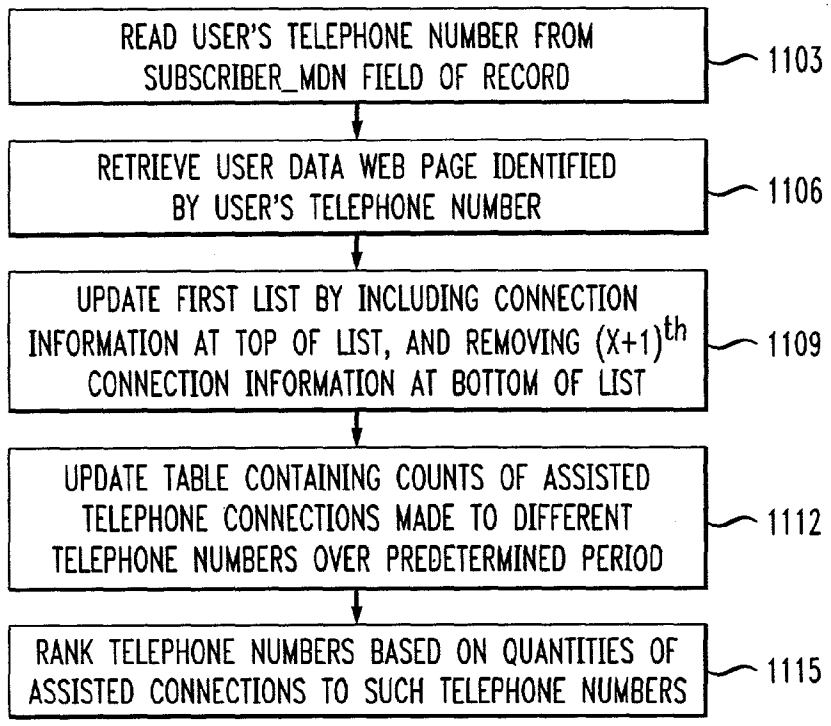
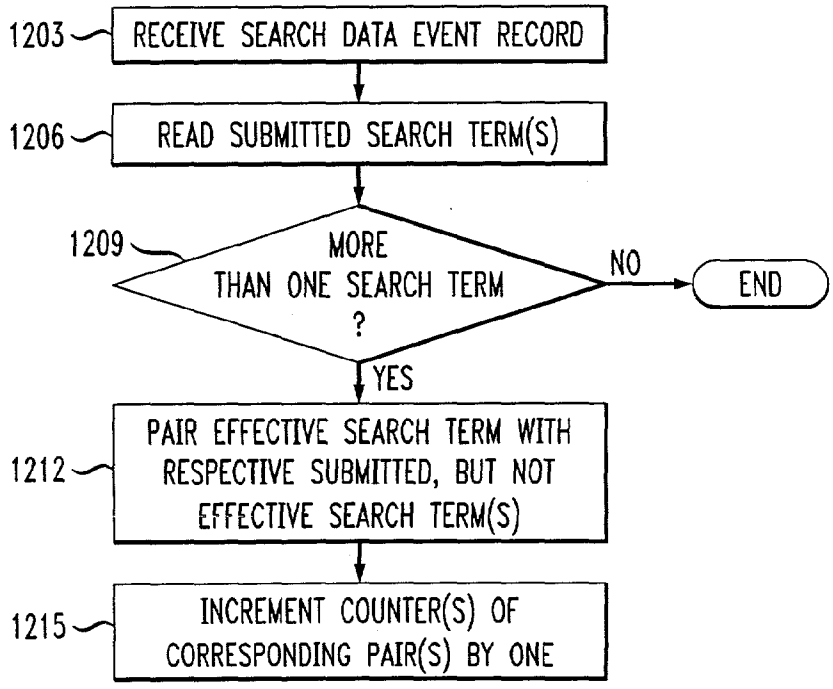

READ USER'S TELEPHONE NUMBER FROM SUBSCRIBER_MDN FIELD OF RECORD
1103
RETRIEVE USER DATA WEB PAGE IDENTIFIED BY USER'S TELEPHONE NUMBER
1106
UPDATE FIRST LIST BY INCLUDING CONNECTION INFORMATION AT TOP OF LIST, AND REMOVING (X+1)th CONNECTION INFORMATION AT BOTTOM OF LIST
1109
UPDATE TABLE CONTAINING COUNTS OF ASSISTED TELEPHONE CONNECTIONS MADE TO DIFFERENT TELEPHONE NUMBERS OVER PREDETERMINED PERIOD
1112
RANK TELEPHONE NUMBERS BASED ON QUANTITIES OF ASSISTED CONNECTIONS TO SUCH TELEPHONE NUMBERS
1115

FIG. 12


1203
RECEIVE SEARCH DATA EVENT RECORD
1206
READ SUBMITTED SEARCH TERM(S)
1209
MORE THAN ONE SEARCH TERM ?
NO
END
YES
1212
PAIR EFFECTIVE SEARCH TERM WITH RESPECTIVE SUBMITTED, BUT NOT EFFECTIVE SEARCH TERM(S)
1215
INCREMENT COUNTER(S) OF CORRESPONDING PAIR(S) BY ONE

TECHNIQUE FOR EFFECTIVELY COLLECTING AND ANALYZING DATA IN PROVIDING INFORMATION ASSISTANCE SERVICES

FIELD OF THE INVENTION

[0001] The invention relates to a communications technique, and more particularly to a technique for collecting data in providing information assistance services, and analyzing the collected data to improve such services.

BACKGROUND OF THE INVENTION

[0002] It is a common experience to call a telephone operator for information assistance. In a typical information assistance call, a user identifies to the operator the name and address (or sometimes city or area code) of a party whose telephone number is desired. In response, the operator locates the desired destination number using, e.g., a computer database. The destination number may be provided to the customer, e.g., by automated voice, and the customer is afforded an option to be connected to the destination number without the need of first terminating the information assistance call.

[0003] Enhanced services may be provided to a user in an information assistance call. For example, upon request, an operator may also search certain databases to obtain for the user information concerning restaurants, movie listings, directions to given places, etc. These traditional databases typically provide such information as the titles of the movies being played, the names of the theaters playing a given movie, and the telephone number of a given theater, etc.

SUMMARY OF THE INVENTION

[0004] Although the traditional databases used in the aforementioned enhanced services provide useful information, they contain no annotative information which may be time sensitive. As a result, relying on such databases, an operator providing information assistance services is most likely unprepared to respond to such inquiries as "What movies seem to be popular tonight;""What restaurants do New Yorkers frequent these days;" etc.

[0005] The invention overcomes the prior art limitations by generating dynamic information in processing information assistance calls to improve and/or supplement the traditional databases. Such dynamic information may result from analyzing the data associated with processing of the calls in accordance with the invention. For example, the dynamic information may include statistics as to the relative frequencies of accessing information concerning particular movies, which are indicative of the popularity of such movies. In addition, the statistics may be generated as a function of time, e.g., the time range within which the movie searches are conducted, and/or the geographic area, e.g., the area in which the inquired movie theaters are located. Such statistics may be frequently updated to provide timely information for responses to the above inquiries.

[0006] Thus, in accordance with the invention, after information assistance calls are received, a database is searched for the requested information. Data is generated in processing the calls, and information is derived from such data which may include, e.g., lists of popular movies and restaurants, and is used for responding to callers' inquiries in subsequent calls.

[0007] In accordance with an aspect of the invention, data is generated when assisted communication connections are established for a user through the service. Information is derived from the data, which concerns at least one of the connections, e.g., the last X connections or the Y most popular connections made by the user. Such information is provided to the user at a predetermined data location, e.g., a predetermined uniform resource locator (URL) on the Internet, which is accessible by the user.

[0008] In accordance with another aspect of the invention, data is generated from processing communication calls which involve a call activity, e.g., a database search. Information is derived from such data, which is used to evaluate the performance of the call activity, e.g., the average time that it takes an operator to complete a database search.

[0009] In accordance with yet another aspect of the invention, when a search is conducted using a first search criterion in response to an information assistance request, a second search criterion may replace the first search criterion in conducting the search pursuant to "fuzzy" logic. The fuzzy logic is developed based on a correlation between the first search criterion and the second search criterion, which is a function of the number of searches prior to the current search where use of the first search criterion is followed by use of the second search criterion, and where use of the second search criterion, but not the first search criterion, produces desired results.

BRIEF DESCRIPTION OF THE DRAWING

[0010] Further objects, features and advantages of the invention will become apparent from the following detailed description taken in conjunction with the accompanying drawing showing an illustrative embodiment of the invention, in which:

[0011] **FIG. 1** illustrates a communications system including information/call centers in accordance with the invention;

[0012] **FIGS. 2A and 2B** are block diagrams of components of the communications system of **FIG. 1**;

[0013] **FIG. 3** illustrates a record of an event occurrence generated in an information/call center;

[0014] **FIG. 4** is a block diagram of an information gateway for analyzing data in event records;

[0015] **FIG. 5** is a flow chart depicting a routine for processing event record data;

[0016] **FIG. 6** is a flow chart depicting a routine for generating a popular movie list;

[0017] **FIG. 7** is a flow chart depicting a routine for evaluating the performance of operators in an information/call center;

[0018] **FIG. 8** illustrates a Login graphical user interface (GUI) for providing a personalized information assistance service;

[0019] **FIG. 9** illustrates a Home GUI;

[0020] **FIG. 10** illustrates an Edit GUI;

[0021] **FIG. 11** is a flow chart depicting a routine for generating statistics concerning user communications; and

[0022] **FIG. 12** is a flow chart depicting a routine for developing fuzzy logic to relate search terms.

DETAILED DESCRIPTION

[0023] The invention is directed to providing information assistance services in an information/call center environment. The traditional databases used in information assistance services provide such useful information as the name, address and/or telephone number of a desired party. However, they are deficient in that they contain no annotative information, which may be time sensitive. As a result, relying on such databases, an operator providing information assistance services is most likely unprepared to respond to such inquiries as "What movies seem to be popular tonight;""What restaurants do New Yorkers frequent these days;" etc. It should be noted that the term "operator" used herein broadly encompasses entities that are capable of providing information assistance in a communication environment, including without limitation human operators, voice response/recognition capabilities, web- or WAP-enabled operator services, and other electronic access.

[0024] The invention overcomes the prior art limitations by generating dynamic information in processing information assistance calls to improve and/or supplement the traditional databases. Such dynamic information may result from analyzing the data associated with the call processing in accordance with the invention. For example, the dynamic information may include statistics as to the relative frequencies of accessing information concerning particular movies or other enhanced information, which are indicative of the popularity of such movies. In addition, the statistics may be generated as a function of time, e.g., the time range within which the movie searches are conducted, and/or the geographic area, e.g., the area in which the inquired movie theaters are located. Such statistics may be frequently updated to provide timely information for responding to such inquiries as "What movies seem to be popular tonight."

[0025] In addition, the invention not only applies to public information assistance services, which are provided to the general public, but also to personalized information assistance services described below, which are available to their subscribers.

[0026] **FIG. 1** illustrates a system for providing both the personalized and public information assistance services in accordance with the invention. As shown in **FIG. 1**, the subject system includes wide area network (WAN) **30** covering an extensive area. WAN **30** can be an Internet-based network such as the World Wide Web or a private intranet based network. WAN **30** connects operators dispersed throughout a wide coverage area in information/call centers **21** through **27**.

[0027] Each of information/call centers **21** through **27** covers one or more regional coverage areas. Referring to **FIGS. 2A and 2B**, information/call center **100** (which generically represents one of aforementioned information/call centers **21** through **27**) is attended by operators, which includes switching matrix platform **114** connected to one or more external T1 voice connections **112**. Switching matrix platform **114** is also connected via T1 communication links **132** to channel bank **116** for coupling to operator telephones **118**.

[0028] Each operator is equipped with a terminal **120** that includes a monitor, mouse and keyboard with associated dialing pad. The operator terminals are coupled over data network **124** to database facility **126**, allowing an operator to access data in database facility **126** through operator terminals **120**. Database facility **126** contains, among others, public directory information.

[0029] Data network **124** further connects to information gateway **321**, voice response unit (VRU) **130**, and switching matrix host computer **128** (also known as a PBX host), which in turn is connected to switching matrix platform **114** by data link **122**. Data network **124** includes, but is not limited to, local area network (LAN) **127**, best seen in **FIG. 2B**. LAN **127** may connect to other similar remote LANs **129** to form WAN **30** in **FIG. 1**. LANs **127** and **129** are connected to one another and to Internet **121** via routers **125**.

[0030] A user's telephone, computer, PDA or other telecommunication device **144** communicates via communications network **146** which is connected to carrier network node **142** and carrier switching center **140**. T1 voice connections **112**, or voice links, provide connection between the information/call center's switching matrix platform **114** and the carrier's switching center **140**, through which incoming information assistance calls are received. T1 voice connections **112** further provide connection to the carrier network over which outgoing calls are placed (which network may be different than that used for incoming calls). Similarly, T1 data connections **113**, or data links, provide a signaling connection between the information/call center's node (not shown) and carrier network node **142**, through which incoming and outgoing signaling messages are transported. The information/call center node is contained within switching matrix platform **114**, but one with skill in the art will appreciate that the information/call center node could also be a physically distinct component. If the outgoing call is being placed over a different network than that on which the incoming call was received, a second data connection to the outgoing network will be established.

[0031] The operation of switching matrix platform **114** is governed by computer-readable instructions stored and executed on switch matrix host computer **128**. VRU **130** is connected via data network **124** to host computer **128** (to which it acts as a slave processor) and via one or more T1 spans to switching matrix platform **114**. Each VRU **130** when more than one is employed in information/call center **100**, connects to switching matrix platform **114** via a separate link. VRU **130** is employed to play the constantly repeated parts of an operator's speech, namely, the various greetings and signoffs (or closings), and the caller's desired telephone number where requested. At appropriate stages in a call progression, switch matrix host computer **128** initiates a voice path connection between VRU **130** and switching matrix platform **114** such that the user, or the user and the operator, are able to hear whatever prerecorded speech is played on that connection by VRU **130**. Computer **128** then instructs VRU **130**, via data network **124**, what type of message to play, and passes data parameters that enable VRU **130** to locate the message appropriate to the call state. VRU **130** may also contain a voice recognition system for receiving verbal input from a party connected to the VRU.

[0032] Database facility **126** enables the operator to provide additional assistance including searching by type of

goods/services and/or geographic region, thereby providing a caller with information on restaurants, movie listings, directions to various places, etc.

[0033] Users of a particular telephone carrier or company may dial, speak or otherwise communicate the access digits, access codes or retail numbers, or input an address or a URL established for information assistance by that company. The instant example assumes that the user dials, e.g., "411, ""*555,""555-1212,""1-800-555-1212,""00," or other designated access numbers. The participating telephone company's own switching system will then reroute the call to information/call center **100** (via a T1 channel), where it appears as an incoming call.

[0034] Automatic call distribution (ACD) logic is used to queue (if necessary) and distribute calls to operators in the order in which they are received, and such that the call traffic is distributed evenly among the operators. In other embodiments, other distribution logic schemes are utilized, such as skills-based routing or a priority scheme for preferred callers. The queue is maintained by switching matrix host computer **128**.

[0035] During an information assistance call, multiple events may occur which include, e.g., a destination number connection event, restaurant search event, movie inquiry event, directions inquiry event, etc. In this illustrative embodiment, a record is created to account for each event. For example, when a user calls for information assistance, and an operator is unavailable, the call is placed in queue by platform **114**. At the same time, host computer **128** generates a first event record concerning the queuing event. When the call is ultimately connected to the operator by platform **114**, host computer **128** then generates a second event record concerning the operator connection event. If the user asks the operator to search for a movie theater playing a given movie in a particular area, the operator utilizes database facility **126** to locate one such theater. Database facility **126** then generates a third event record concerning the movie search event, and a fourth event record concerning the search results including information about the located theater. Further, if the user asks to be connected to the destination number of the located theater, the operator initiates a call to the destination number through database facility **126**, which then generates a fifth event record concerning the call initiation. Accordingly, platform **114** connects the current information assistance call to the destination number, and host computer **128** generates a sixth event record concerning the connection. If the connection results in ringing with no answer, VRU **130** presents to the user menu options for selection, and generates a seventh event record concerning the menu presentation. If for any reason the user utilizes a StarBack® service to be reconnected to an operator, platform **114** generates an eighth event record concerning the StarBack® event. As one can appreciate that as the information assistance call goes on, more and more events may occur and thus event records are generated during the call.

[0036] As discussed below, the generated event records are transmitted to information gateway **321** for further processing. In that regard, information gateway **321** acts as a server in relation to such clients as host computer **128**, database facility **126** and VRU **130**. **FIG. 3** illustrates one such event record (denoted **200**) which is generated by a client, e.g., database facility **126**, during an information assistance call. As shown in **FIG. 3**, event record **200** includes multiple fields describing a search result event. Specifically, EVENT_MONITOR_ID field **203** contains a sequence of alphanumeric characters uniquely identifying event record **200**. SUBSCRIBER_MDN field **207** identifies the telephone number of the user who made the information assistance call. IN_SPAN field **209** identifies the T1 span transporting the incoming communication of the information assistance call. In this illustrative embodiment, each event is identified by an event type within an event class. EVENT_CLASS_ID field **211** specifies one of the event classes to which the instant event belongs. For example, the value "30" in field **211** in this instance corresponds to a SEARCHES class. Other values for field **211** may correspond, e.g., to CALL PROCESSING, VALUE ADDED SERVICE and LOCAL SERVICES classes. EVENT_TYPE_ID field **247** specifies one of the event types within the class identified by the value in field **211**. For example, the value "15" in field **247** in this instance corresponds to a movie search result event within the SEARCHES class. Similarly, other values for field **247** correspond to different types of event in an identified class.

[0037] CDR_CALL_SEQ_NMBR field **213** contains a sequence number identifying the information assistance call in question. It should be pointed out that event records concerning different events occurring in the same call share the same value in field **213**. To that end, when the information assistance call is initially received by switching matrix platform **114**, host computer **128** assigns a sequence number identifying the call. It then generates and transmits a network message to every other client connected to network **124**, informing the client of use of the same sequence number to identify the current call.

[0038] It should be noted at this point that with the above server-client arrangement, the clients can be flexibly connected locally or remotely to contribute data or services in handling the current call or subscriber session. Further, knowing the call sequence number identifying the current call/session, each client generates events as it provides the data/services, without the need to be aware of prior actions by another client. The events are correlated after the fact to provide a complete activity record for the call/session whose data can be incorporated in a database. Thus, the advantage here is that clients can be added to the system, new events generated or existing events modified without the need to alter any other client in the system or the database.

[0039] Name field **217** contains a particular movie title, e.g., STAR WARS, for which the movie search was conducted. IN_CHANNEL field **221** identifies the channel (within the T1 span identified by field **209** previously described) which the incoming communication of the information assistance call traverses. OUT_CHANNEL field **225** identifies the channel (within the T1 span identified by field **249** described below) which the outgoing communication of the information assistance call traverses. ESTABLISHMENT_NAME field **229** contains the name of the movie theater, e.g., XYZ Multiplex Cinema, resulting from the movie search. ADDRESS field **231** contains the address of the movie theater. CITY field **233** contains the name of the city, e.g., New York, which the movie theater is in. STATE field **235** contains the name of the state which the movie theater is in. CARRIER_ID field **237** identifies the carrier used to connect the call. For example, the value "79" in field

237 identifies AT&T Corp. as the carrier in this instance. DATA_SOURCE_ID field **239** identifies the client which generates record **200**. EVENT_START_TIME field **241** indicates the start time of the event in question. It should be noted that the value in field **241** corresponds to a UNIX "epoch" time, i.e., the number of seconds elapsed from Jan. 1, 1970. Similarly, EVENT_END_TIME field **245** indicates the end time of the event in question. Thus, with such event start and end times, the duration of the event in question can be determined. OPERATOR_LOGIN_ID field **243** identifies the operator handling the event. Field **247** is described previously. OUT_SPAN field **249** identifies the T1 span transporting the outgoing communication of the information assistance call.

[**0040**] In this instance, each event record is further formatted by the client generating the record in packet form by adding a header to the record. Such a header includes the destination address of gateway **321** to which the packet is routed, and a destination type indicating what database in data server **40** in **FIGS. 1 and 4** to which the event record pertains. For example, the instant destination type may indicate a movie database in server **40**.

[**0041**] In a conventional manner, data network **124** routes event record packets to gateway **321** based on the gateway destination address therein. After receiving the event record packets, gateway **321** determines the destination type in the header of each received packet. In this example, the destination type indicates that the event record content of the packet pertains to a movie database in server **40**, which is denoted **315** in memory **313**. As such, gateway **321** in turn forwards the event record to server **40** through WAN **30**. In accordance with an aspect of the invention, server **40** generates statistics of popular movies for selected periods and/or geographic areas, e.g., a list of popular movies within the last 12 hours in New York.

[**0042**] We have recognized a positive correlation between the popularity of a particular movie and the number of information assistance inquiries about the movie. That is, the higher the number of searches by an operator concerning a particular movie is in response to information assistance inquiries, the more popular the movie.

[**0043**] After receiving from gateway **321** the event record, say, event record **200**, through interface **307**, processor **311** in server **40** inspects the received record. Specifically, processor **311** checks fields **211** and **247** of the received record for the appropriate event class ID and event type ID, respectively, to verify the nature of the event, e.g., a movie search result event. Understanding that the received event record concerns movie search results, processor **311** stores the event record in particular movie data storage in database **315** for later analysis.

[**0044**] In this illustrative embodiment, database **315** also includes tables concerning different movie statistics. One such table may concern popular movies in the last 12 hours nationwide; another table may concern popular movies in the last week nationwide; yet another table may concern popular movies in the last 12 hours in a particular geographic area, etc. Each table contains movie records associated with different movies, respectively. For example, in a table, say, table A, which concerns popular movies in the last 12 hours nationwide, each movie record contains a count of search result events created for the associated movie over the last 12 hours. To that end, processor **311** from time to time updates table A. During each update, processor **311** selects from the movie data storage those movie search result event records having the event start time in field **241** within the last 12 hours, as indicated at step **503** in **FIG. 5**. Processor **311** at step **506** obtains from NAME field **217** of each selected event record a movie title. Processor **311** at step **509** determines whether in table A a movie record has been created for the movie title just obtained. If it is determined that such a movie record has been created, processor **311** at step **512** increases the count in the movie record by one. Otherwise, if it is determined that the movie record has not been created in table A, processor **311** at step **515** creates a record containing the movie title, and sets the count in the record to one.

[**0045**] To generate a list of popular movies within last 12 hours nationwide, processor **311** sorts the movie records in table A by their respective counts, from the highest to the lowest, as indicated at step **603** in **FIG. 6**. Processor **311** at step **606** assigns a score of **100** to the most oft-searched movie associated with the leading record having the maximum count. At step **609** processor **311** assigns a score of 0-100 to each other movie, in proportion to its count in the associated record relative to the maximum count. The movie titles in the sorted movie records and the respective scores constitute the popular movie list in question.

[**0046**] Other popular movie lists are similarly generated, with modification to step **503** in **FIG. 5**. For instance, in generating a popular movie list for a different period, e.g., the last week, the event records selected at step **503** should satisfy such a period requirement. Furthermore, in generating a popular movie list for a given period and geographic area, the event records selected at step **503** should satisfy such period and geographic area requirements. The geographic area information associated with an event may be derived from CITY field **233** and STATE field **235** in the event record.

[**0047**] Each popular movie list, thus generated, is distributed by server **40** to gateway **321** (and the gateways of other information/call centers), which incorporates the ranking and score information from the list into the movie listing records in database facility **126** as separate fields, e.g., 12-hour national rank field, 12-hour national score field, etc. This being so, when an operator accesses facility **126** to conduct a search for a particular movie, the search results would include the movie's rank(s) and score(s) as field elements, along with such other field elements as the theater's name, address, etc. In addition, when an operator queries facility **126** for popular movies with certain criteria, the returned movie listings satisfying the criteria are sorted by rank. For example, to respond to the above inquiry "what movies seem to be popular tonight," an operator may query facility **126** for popular movies within the last 12 hours nationwide. The operator can then communicate to the user the movie titles, theater information, etc. from the returned movie listings which are presented in the order of their rank.

[**0048**] Similarly, based on the search result event records resulting from searches for an entity, e.g., a restaurant, nightclub, store, museum, plumbing service, travel service, etc., processor **311** generates the corresponding popular entity list for a given period and/or geographic area. It should be noted that where the length of the period used is

relatively short, e.g., a month, the popular entity may only be topically popular. On the other hand, where the length of the period is relatively long, e.g., a year, the popular entity would be consistently popular. In addition, where the period coincides with a season, the popularity of an entity can be determined on a seasonal basis.

[0049] Server **40** maintains databases for selected types of entity, e.g., movie database **315** described above, restaurant database **317**, nightclub database **319**, etc. in memory **313**. For instance, in generating a popular restaurant list with certain criteria, processor **311** selects those restaurant search event result records satisfying such criteria from storage in database **317**. Processor **311** then processes the selected records in a similar manner to steps **506**, **509**, **512** and **515** in **FIG. 5** (except in the context of restaurant names—as opposed to movie titles—derived from the ESTABLISHMENT_NAME field), resulting in the corresponding restaurant records containing their respective counts of search events created for the associated restaurants. To generate the popular restaurant list, processor **311** performs a process similar to that of **FIG. 6**, resulting in the ranked restaurant records containing the respective restaurant names and scores, which constitute the popular restaurant list in question.

[0050] It should be noted that different dimensions may be added to the popular restaurant list. For example, lists of popular restaurants specialized in particular cuisines may be generated based on the data in restaurant database **317** and another database associating restaurants with their cuisine specialties.

[0051] In addition, based on city and state information in fields **231** and **235** of the restaurant search result event records, a regional favorite restaurant list may be generated. For example, to generate a New York favorite restaurant list, processor **311** screens the restaurant search result event records for those records having (CITY, STATE)=(New York, N.Y.). The selected records are then processed in a similar manner to creating the popular restaurant list described above. With the appropriate New York popular restaurant information incorporated in database facility **126**, an operator can readily respond to such inquiries as "What restaurants do New Yorkers frequent these days." It should be noted at this juncture that processor **311** can be programed to perform numerous analyses, limited only by the types of information received in the event records. For example, with information provided by EVENT_CLASS_ID field **211** and EVENT_TYPE_ID field **247** in the received event records indicating a particular call activity, processor **311** may be programmed to generate statistics concerning the number of information assistance calls handled over a predetermined period which involve the particular call activity. One such call activity may include a search for listings in a particular category, e.g., a search for listings in the restaurant category, movie category, plumbing category, etc. In that case, by applying the processes similar to those of **FIGS. 5 and 6** to the appropriate event records, processor **311** generates a popular search category list.

[0052] In another embodiment, a directions client (not shown) is connected to data network **124**, which provides travel directions, e.g., turn-by-turn directions, in response to a directions request containing an origination, a desired destination and/or other information. In some cases, the origination information may be provided directly from the user's communication device. In any event, the directions client generates a directions event record containing, among others, the origination and destination information each time when a request for travel directions from the origination to the destination is fulfilled. Based on such directions event records, processor **311** similarly generates a popular origination-destination list which may benefit travelers and, in particular, tourists. Having access to such popular origination-destination information, the operator may readily suggest to a user popular destinations given an origination by the user.

[0053] In yet another embodiment, a search event record contains data identifying one of the databases which was searched. In that embodiment, processor **311** is programed to generate a popular database list. By applying the processes similar to those of **FIGS. 5 and 6** to the records of search events within a predetermined period in which identifiable databases were searched, processor **311** generates a popular database list.

[0054] In still yet another embodiment, processor **311** is programed to generate statistics which help maintain service quality control of information/call center **100**. For example, to determine the efficiency of the operators at center **100** in providing a particular service, e.g., a restaurant search, processor **311** at step **703** in **FIG. 7** screens the received event records for those concerning a restaurant search. Processor **311** at step **706** groups the selected restaurant search records according to the operators at center **100**, who performed the searches and are identified by the value in OPERATOR_LOGIN_ID field **243** in the records. For each operator, processor **311** at step **709** determines, based on the event start time and end time information in the records associated with the operator, the average time that it takes the operator to complete a restaurant search over a predetermined number of searches. Processor **311** at step **712** ranks the operators according to their average search time, with the operator having the shortest average time ranked first. Based on such ranking, incentives may be afforded to the relatively efficient operators while additional training may be required of the relatively inefficient operators.

[0055] In another embodiment, the average times required by the operators in information/call center **100** performing different services are determined (e.g., from step **709** where the service is a restaurant search) and analyzed. Based on such an analysis, information/call center management can effectively adjust the required staffing levels and operator skills. For example, the analysis may show a trend that the percentage of operator call processing time for restaurant searches grows from 5% to 10% on Fridays. In that case, the management accordingly increases the number of operators on duty who are proficient in restaurant searches each Friday.

[0056] Referring back to **FIG. 1**, one or more information hubs **10** for providing a personalized information assistance service to subscribers are also included in WAN **30**. An information hub **10** includes one or more personalized information servers **28**, which are accessible by the operators in the system, and one or more databases **20** in which subscribers' information, e.g., subscribers' contacts information (also known as "private directories"), is stored and maintained. Such information may also be stored locally at one or more of the information/call centers.

[0057] It should be noted at this juncture that although the ensuing discussion illustratively focuses on subscribers' contacts information, which is organized in contacts folders, it similarly applies to other subscribers' information, e.g., appointments, to-do lists, notes, email, events, products and other information which may be tailored to the needs of an individual, or a group, e.g., a corporation, an organization, or a collection of people having a common interest. Thus, in this illustrative embodiment, the contacts folders contain contacts information pertaining to an individual or a group. For instance, an individual may want to create multiple contacts folders for different purposes. Such contacts folders may include a personal contacts folder containing personal contacts information, a business contacts folder containing business contacts information, and a softball group contacts folder containing contacts information which pertains to the softball league to which the individual belongs.

[0058] A group, e.g., a company, may take advantage of the personalized information assistance service by keeping contacts information of all of its employees in a contacts folder. Different levels of access may be set up for different employees.

[0059] With the personalized information service, a contacts folder may be created and maintained (1) directly through the Internet or other network or communications means, (2) indirectly through an operator, and/or (3) using a personal information manager (PIM). Well known PIMs include, e.g., hand-held devices such as personal digital assistants (PDAs) and wireless communicators; and computer devices such as notebook, laptop and desktop computers running software applications such as Microsoft Outlook, Outlook Express, Goldmine, Symantec Act!, Lotus Organizer and Lotus Notes. Other PIMs may include proprietary PIM systems and applications. In case (3), by running a synchronization engine, the user may update any contacts data which has been changed (added, edited or deleted) in a PIM data source in the corresponding contacts folder, and vice versa.

[0060] In case (2), the user accesses a contacts folder through communications with an operator at an information/call center via telecommunication media, e.g., wireless telephone, wireline telephone, voice over Internet protocol (VoIP), PDA, VPN, etc. The operator is provided with web browsing capabilities, telephone facilities as well as fully-featured operator user interface applications which facilitate the searching, retrieval and administering of database **20** through server **28**.

[0061] Without loss of generality, the user in this instance wants to access a contacts folder through an operator. To that end, the user uses telecommunication device **144**, e.g., a wireless telephone, to call an operator at a designated access number. Let's say the call is routed to information/call center **100** where an operator attends to the call. After the user communicates to the operator his/her needs, the operator at terminal **120** accesses personalized information server **28** through WAN **30** (or alternatively Internet **121**). In response, server **28** presents on terminal **120** a Login graphical user interface (GUI) which is opened by a browser running on terminal **120**. **FIG. 8** illustrates such a Login GUI, where the operator is prompted to enter the user's phone number or username to identify the user, and a password to verify that the user is authorized to access the personalized information service. It will be appreciated that other user information, e.g., a personal identification number (PIN), his/her mother's maiden name, etc. may be used for verification purposes as well.

[0062] It should be noted at this point that the user identification and password are established beforehand through a registration process. For example, to join the personalized information service, the user can call an operator at the designated access number. As part of the registration, the operator enters at a user data web page on server **28** the user information including username, password, etc. The user data web page in this instance is identified by a telephone number of the particular telecommunication device, e.g., wireless phone, which the user would normally use to call the service. It is particularly advantageous to use such a telephone number (also known as a mobile directory number (MDN) in the case of a wireless phone number) to identify the user data web page since the calling number would be automatically captured at information/call center **100** when the user calls. Specifically, platform **114** in center **100** in a well known manner derives, from the call set-up signals associated with the user's call, the user's phone number from which the call originates, also known as the automatic number identification (ANI).

[0063] Thus, referring to **FIG. 8**, the ANI of the user is automatically provided in entry **801** by platform **114**, thereby obviating the need of the operator's eliciting from the user, and entering, the required phone number or username. (In the event that such an ANI is not automatically available or where the user is accessing the subject service from an unknown point, the user may supply via voice or other input, with or without prompting, the necessary identifying information.) At entry **804**, the operator enters the password provided by the user to complete the login process. The login information is then transmitted to server **28**, where it checks the aforementioned user data web page to verify the received ANI and password. After they are verified, server **28** identifies from the user data web page all of the folders including appointments folders associated with the received ANI, and any user's access rights thereto. Server **28** then presents to terminal **120** a Home GUI, listing all such folders. **FIG. 9** illustrates the Home GUI, which lists, among others, contacts folders **907** and **909** designated "Company Contacts" and "My Contacts," respectively. The operator can then access the desired contacts folder, and manage the contacts data in the desired folder for the user, subject to the user's access rights. The operator may also direct the call to interactive voice response (IVR) unit **29** connected to server **28** in **FIG. 1** to allow the user to hear selected contacts information.

[0064] By way of example, instructed by the user, the operator in this instance selects option **915** to edit/view contacts information in folder **909**. In response, server **28** presents on terminal **120** an Edit GUI, listing the contacts information in folder **909**. This GUI is illustrated in **FIG. 10**, where for each contact, e.g., Bob, his/her name, home phone number, business phone number and mobile phone number, if any, are displayed, although additional information concerning the contact, e.g., his/her postal and electronic mail addresses, may be available but is not displayed for lack of room. For that reason, a More option is provided for selection to present the additional information on a separate

display. In addition, for each contact an Edit option is provided to edit the contact information.

[0065] Continuing the above example, the user in this instance requests the operator to connect him/her to Bob at home. To that end, the operator at terminal **120** selects Bob's home telephone number **1005**, and signals switching matrix platform **114** through computer **128** to connect the user's call to the selected number **1005**. Computer **128** receives from the browser on terminal **120** not only telephone number **1005**, but also information concerning the listed name (e.g., Bob) and communication method (e.g., home telephone communication) associated with telephone number **1005**. Computer **128** causes platform **114** to establish an outgoing connection with the communications device associated with telephone number **1005**, and bridge the user's already established incoming connection to the outgoing connection, thereby connecting the user to telephone number **1005**. Computer **128** then generates a record of the assisted call connection event having a format similar to that of record **200**. The record is transmitted to gateway **321** in the form of a packet, with a header indicating that the record pertains to the personalized information database, e.g., database **20**.

[0066] In this instance, as part of the personalized information assistance service, the user is provided with a first list tracking the last X connections made by the user, where X represents a predetermined number. In addition, the user is provided with a second list tracking the Y most popular connections made by the user over a predetermined period, where Y represents a predetermined number. To generate and maintain such lists, after reviewing the header information in the aforementioned event record, processor **311** in gateway **321** reads the user's telephone number from SUBSCRIBER_MDN field **207** of the record, as indicated at step **1103** in **FIG. 11**. Processor **311** at step **1106** retrieves from server **28** the user data web page identified by the user's telephone number. Processor **311** at step **1109** updates the aforementioned first list (or generates if it does not exist) by including the connection information (e.g., the contact name Bob, home telephone communication method and telephone number **1005**) in the record at the top of the list, and removing the (X+1)th connection information at the bottom of the list. At step **1112**, processor **311** updates a table containing the counts of assisted telephone connections made to different telephone numbers over the predetermined period. The table also contains the times at which the assisted telephone connections were made, and the associated connection information. In this instance, processor **311** increases the count of the assisted telephone connection to Bob's home telephone number **1005** by one. In addition, processor **311** discounts those assisted connections which become stale, i.e., outside the predetermined period. Processor **311** at step **1115** ranks the telephone numbers based on the quantities of assisted connections to such telephone numbers, resulting in the aforementioned second list of Y most popular connections.

[0067] Processor at step **1118** provides the first and second lists on the user's data web page which are accessible by the user, e.g., at a predetermined uniform resource locator (URL) on the Internet.

[0068] It should be noted that although in the above illustrative embodiment, the lists of last X connections and Y most popular connections are derived from the contact folders associated with a user, the invention broadly encompasses the concept of keeping track for the user of connection information not only from such contact folders, but also any public directories, e.g., electronic white pages. Thus, in accordance with the invention, the above last X connection list may include connections made after an operator's consulting the contact folders and/or public directories. The above Y most popular connection list may also include connections made after an operator's consulting the contact folders and/or public directories.

[0069] Searches Aided by Fuzzy Logic

[0070] In accordance with another aspect of the invention, processor **311** learns from searches performed by the operators at center **100**, and develops "fuzzy" logic to aid the operators to streamline the searches. By keeping track of the initial search criteria submitted (e.g., "Seers Roebuck") to database facility **126** and the actual search term used (e.g., "Sears Roebuck") to obtain the desired search results, processor **311** develops over time the fuzzy logic correlating the submitted search term ("Seers Roebuck") and the effective search term ("Sears Roebuck"). Specifically, database facility **126** records keystrokes by an operator conducting a search using database facility **126**. The recorded key strokes are transmitted to gateway **321** as part of a search data event record for each successful search. After processor **311** receives one such search data event record, as indicated at step **1203** in **FIG. 12**, processor **311** at step **1206** reads the search term(s) (e.g., "Seers Roebuck", "Seer Roebucks", and "Sears Roebuck") submitted during the search from the received record. In this instance, the search terms appear in a sequence in the record, and the one appearing last in the sequence is the effective search term, for which facility **126** provides the desired listing. Processor **311** at step **1209** determines whether the received record contains more than one search term. If it is negative, the subject routine comes to an end. Otherwise, the routine proceeds to step **1212** where processor **311** pairs the effective search term ("Sears Roebuck") with the respective submitted, but not effective, search term(s) ("Seers Roebuck,""Seer Roebucks"). For each pair, processor **311** maintains a counter for keeping track of the number of its occurrences. At step **1215**, processor **311** increments the counter(s) of the corresponding pair(s) by one. When one such counter reaches a predetermined value, indicating frequent mistaking by operators of one search term for the other search term in a pair, processor **311** incorporates the fuzzy logic into database facility **126**, correlating between the effective search term and its mistaken counterpart. As a result, on detecting an entry of one such mistaken counterpart in a search, database facility **126** automatically suggests the effective search term for adoption in the search, or replaces it with the effective search term.

[0071] The foregoing merely illustrates the principles of the invention. It will thus be appreciated that those skilled in the art will be able to devise numerous other arrangements which embody the principles of the invention and are thus within its spirit and scope.

[0072] For example, information/call center **100** is disclosed herein in a form in which various functions are performed by discrete functional blocks. However, any one or more of these functions could equally well be embodied

in an arrangement in which the functions of any one or more of those blocks or indeed, all of the functions thereof, are realized, for example, by one or more appropriately programmed processors.

What is claimed is:

1. A system for providing an information assistance service comprising:

a database;

an interface for receiving communication calls requesting information, the database being searched for the requested information;

one or more devices for generating data in processing the communication calls; and

a processor for deriving information from the data, the derived information being used for responding to information requests in communication calls.

2. The system of claim 1 wherein one or more of the communication calls are initiated from a mobile device.

3. The system of claim 2 wherein the mobile device includes a wireless telephone.

4. The system of claim 2 wherein the mobile device includes a personal information manager (PIM).

5. The system of claim 1 comprising a call center.

6. The system of claim 1 wherein the interface includes a switching facility.

7. The system of claim 1 wherein the one or more devices include a facility for accessing the database.

8. The system of claim 1 wherein the data concerns events of searching for entities.

9. The system of claim 8 wherein the derived information concerns search categories.

10. The system of claim 8 wherein the derived information concerns selected entities.

11. The system of claim 10 wherein the selected entities are selected as a function of the numbers of searches for the respective selected entities.

12. The system of claim 11 wherein the selected entities include restaurants.

13. The system of claim 11 wherein the selected entities include movies.

14. The system of claim 1 wherein the requested information concerns travel directions.

15. A system for providing a communications service comprising:

a mechanism for assisting a user to establish communication connections;

one or more devices for generating data in establishing the communication connections;

a processor for deriving information from the data, the information concerning at least one of the communication connections; and

a server for providing the information at a predetermined data location accessible by the user.

16. The system of claim 15 wherein the predetermined data location is accessible through a communication network.

17. The system of claim 16 wherein the communication network includes at least part of an Internet.

18. The system of claim 15 wherein the predetermined data location includes a uniform resource locator (URL).

19. The system of claim 15 wherein the mechanism includes receiving from the user communication calls requesting assistance in establishing the communication connections.

20. The system of claim 19 wherein one or more of the communication calls are initiated from a mobile device.

21. The system of claim 20 wherein the mobile device includes a wireless telephone.

22. The system of claim 20 wherein the mobile device includes a PIM.

23. The system of claim 15 comprising a call center.

24. The system of claim 15 wherein the data concerns an occurrence of an event in assisting the user to establish at least one of the communication connections.

25. The system of claim 24 wherein the event concerns a search for an entity to which the at least one communication connection is established.

26. The system of claim 25 wherein the search is conducted using a data source associated with the user.

27. The system of claim 26 wherein the data source contains contacts information.

28. The system of claim 27 wherein the data source is identified by a telephone number of the user.

29. A system for evaluating performance of an information assistance service comprising:

a mechanism for processing communication calls which involve a call activity;

one or more devices for generating data in processing the communication calls; and

a processor for deriving information from the data, the information being used to evaluate a performance of the call activity.

30. The system of claim 29 wherein the call activity is performed by an operator.

31. The system of claim 29 wherein the data includes information identifying an operator.

32. The system of claim 29 wherein the data concerns the call activity.

33. The system of claim 32 wherein the call activity includes conducting a search.

34. The system of claim 33 wherein the information concerns time for conducting a search.

35. The system of claim 34 wherein the performance is evaluated based on an average time for conducting a search.

36. The system of claim 29 wherein one or more of the communication calls are initiated from a mobile device.

37. The system of claim 36 wherein the mobile device includes a wireless telephone.

38. The system of claim 37 wherein the mobile device includes a PIM.

39. The system of claim 29 comprising a call center.

40. A system for providing an information assistance service comprising:

a communication interface for receiving a request for information; and

a search facility for conducting a search using a first search criterion in response to the request, a second search criterion being provided in lieu of the first search criterion in conducting the search based on a correlation between the first search criterion and the second search criterion, the correlation being a function of the number of searches prior to the search where use of the

first search criterion is followed by use of the second search criterion, and where use of the second search criterion, but not the first search criterion, produces desired results.

41. The system of claim 40 wherein the request is communicated in a communication call.

42. The system of claim 41 wherein the communication call is initiated from a mobile device.

43. The system of claim 42 wherein the mobile device includes a wireless telephone.

44. The system of claim 42 wherein the mobile device includes a PIM.

45. The system of claim 40 comprising a call center.

46. The system of claim 40 wherein the communication interface includes a switching facility.

47. The system of claim 40 wherein the first search criterion includes a first search term, and the second search criterion includes a second search term.

48. The system of claim 40 further comprising one or more devices for generate data concerning the searches.

49. The system of claim 48 wherein the data includes the first search criterion and the second search criterion.

50. The system of claim 48 wherein the one or more devices include the search facility.

51. A method for providing an information assistance service comprising:

receiving communication calls requesting information;

searching a database for the requested information;

generating data in processing the communication calls; and

deriving information from the data, the derived information being used for responding to information requests in communication calls.

52. The method of claim 51 wherein one or more of the communication calls are initiated from a mobile device.

53. The method of claim 52 wherein the mobile device includes a wireless telephone.

54. The method of claim 52 wherein the mobile device includes a PIM.

55. The method of claim 51 wherein the data concerns events of searching for entities.

56. The system of claim 55 wherein the derived information concerns search categories.

57. The method of claim 55 wherein the derived information concerns selected entities.

58. The method of claim 57 wherein the selected entities are selected as a function of the numbers of searches for the respective selected entities.

59. The method of claim 58 wherein the selected entities include restaurants.

60. The method of claim 58 wherein the selected entities include movies.

61. The method of claim 51 wherein the requested information concerns travel directions.

62. A method for providing a communications service comprising:

assisting a user to establish communication connections;

generating data in establishing the communication connections;

deriving information from the data, the information concerning at least one of the communication connections; and

providing the information at a predetermined data location accessible by the user.

63. The method of claim 62 wherein the predetermined data location is accessible through a communication network.

64. The method of claim 63 wherein the communication network includes at least part of an Internet.

65. The method of claim 62 wherein the predetermined data location includes a URL.

66. The method of claim 62 further comprising receiving from the user communication calls requesting assistance in establishing the communication connections.

67. The method of claim 66 wherein one or more of the communication calls are initiated from a mobile device.

68. The method of claim 67 wherein the mobile device includes a wireless telephone.

69. The method of claim 67 wherein the mobile device includes a PIM.

70. The method of claim 62 wherein the data concerns an occurrence of an event in assisting the user to establish at least one of the communication connections.

71. The method of claim 70 wherein the event concerns a search for an entity to which the at least one communication connection is established.

72. The method of claim 71 wherein the search is conducted using a data source associated with the user.

73. The method of claim 72 wherein the data source contains contacts information.

74. The method of claim 72 wherein the data source is identified by a telephone number of the user.

75. A method for evaluating performance of an information assistance service comprising:

processing communication calls which involve a call activity;

generating data in processing the communication calls; and

deriving information from the data, the information being used to evaluate a performance of the call activity.

76. The method of claim 75 wherein the call activity is performed by an operator.

77. The method of claim 75 wherein the data includes information identifying an operator.

78. The method of claim 75 wherein the data concerns the call activity.

79. The method of claim 78 wherein the call activity includes conducting a search.

80. The method of claim 79 wherein the information concerns time for conducting a search.

81. The method of claim 80 wherein the performance is evaluated based on an average time for conducting a search.

82. The method of claim 75 wherein one or more of the communication calls are initiated from a mobile device.

83. The method of claim 82 wherein the mobile device includes a wireless telephone.

84. The method of claim 82 wherein the mobile device includes a PIM.

85. A method for providing an information assistance service comprising:

receiving a request for information;

conducting a search using a first search criterion in response to the request; and

providing a second search criterion in lieu of the first search criterion in conducting the search based on a correlation between the first search criterion and the second search criterion, the correlation being a function of the number of searches prior to the search where use of the first search criterion is followed by use of the second search criterion, and where use of the second search criterion, but not the first search criterion, produces desired results.

86. The method of claim 85 wherein the request is communicated in a communication call.

87. The method of claim 86 wherein the communication call is initiated from a mobile device.

88. The method of claim 87 wherein the mobile device includes a wireless telephone.

89. The method of claim 87 wherein the mobile device includes a PIM.

90. The method of claim 85 wherein the first search criterion includes a first search term, and the second search criterion includes a second search term.

91. The method of claim 85 further comprising generating data concerning the searches.

92. The method of claim 91 wherein the data includes the first search criterion and the second search criterion.

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