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(45) **Date of Patent: Nov. 8, 2011**

(54) **SYSTEM AND METHOD FOR RECOGNIZING AND STORING INFORMATION AND ASSOCIATED CONTEXT**

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(51) **Int. Cl.**
G06F 17/27 (2006.01)

(52) **U.S. Cl.** **715/255**; 715/230; 715/231; 715/232; 715/233; 715/254; 715/256

(58) **Field of Classification Search** 715/230–233, 715/254
See application file for complete search history.

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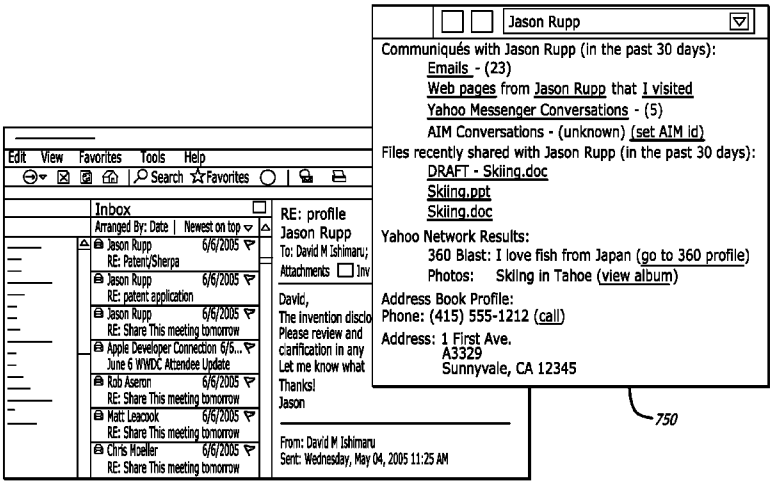
Assistant Examiner — Andrew Dyer
(74) *Attorney, Agent, or Firm* — James J. DeCarlo; Greenberg Traurig, LLP

(57) **ABSTRACT**

The present disclosure provides a system and method of collecting information and associated context. Information and associated context are collected by monitoring at least one application program executable using the computing system, so as to detect one or more events associated with the at least one application program; identifying contextual information corresponding to the detected one or more events; and storing information associated with the at least one detected event, the stored information including the identified contextual information.

30 Claims, 14 Drawing Sheets



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Jason Rupp (jason_rupp_43) - Instant Messa...
Conversation Edit View Contact Help
Jason Rupp
Jason Rupp: Hello
IMVironment
Send
Last message received on 3/9/2005 at 3:57 PM
IM with Jason Rupp
3 Conversations
2 Files
2 Appointments
View More
PRD DRAF...
MarketCaster-Mic...
Microsoft Excel-h...
Microsoft PowerPoi...
Adobe Photoshop
11:06 AM

Figure 1A

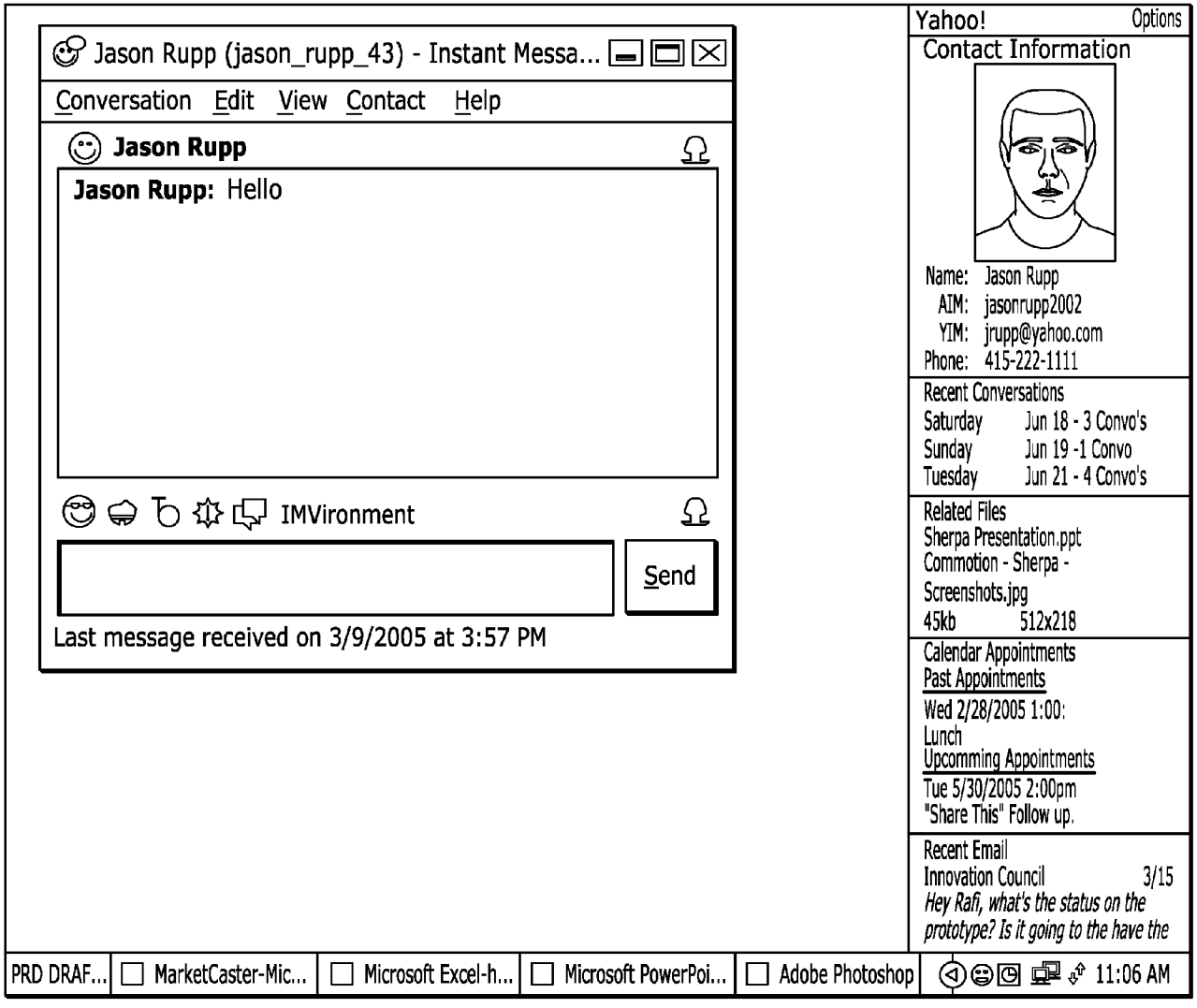

Jason Rupp (jason_rupp_43) - Instant Messa...
Conversation Edit View Contact Help
Jason Rupp
Jason Rupp: Hello
IMVironment
Send
Last message received on 3/9/2005 at 3:57 PM
Yahoo!
Options
Contact Information
Name: Jason Rupp
AIM: jasonrupp2002
YIM: jrupp@yahoo.com
Phone: 415-222-1111
Recent Conversations
Saturday Jun 18 - 3 Convo's
Sunday Jun 19 -1 Convo
Tuesday Jun 21 - 4 Convo's
Related Files
Sherpa Presentation.ppt
Commotion - Sherpa - Screenshots.jpg
45kb 512x218
Calendar Appointments
Past Appointments
Wed 2/28/2005 1:00: Lunch
Upcomming Appointments
Tue 5/30/2005 2:00pm "Share This" Follow up.
Recent Email
Innovation Council 3/15
Hey Rafi, what's the status on the prototype? Is it going to the have the
PRD DRAF...
MarketCaster-Mic...
Microsoft Excel-h...
Microsoft PowerPoi...
Adobe Photoshop
11:06 AM

Figure 1B

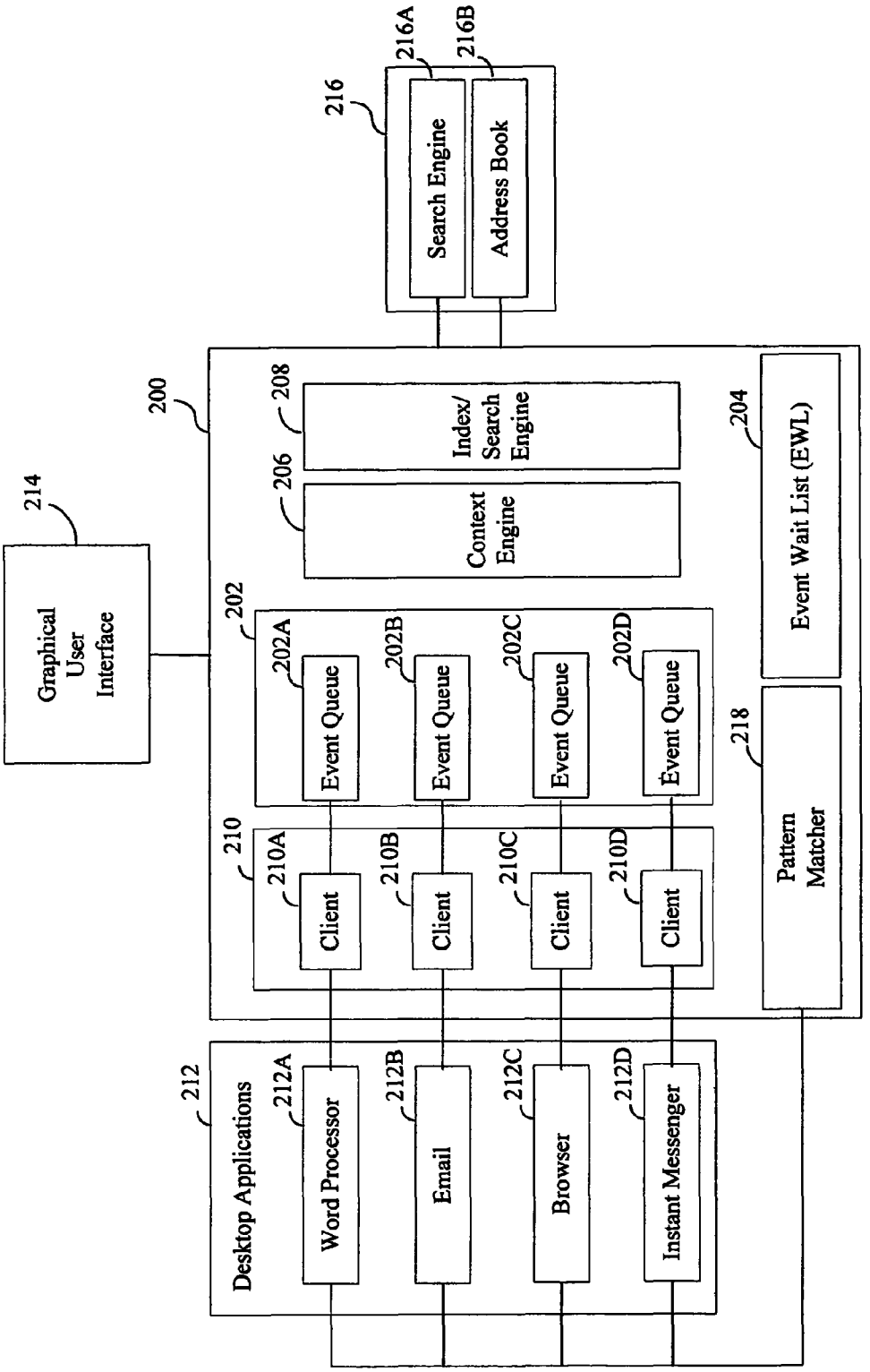

216
216A
Search Engine
216B
Address Book
200
208
Index/ Search Engine
206
Context Engine
204
Event Wait List (EWL)
214
Graphical User Interface
202
202A
Event Queue
202B
Event Queue
202C
Event Queue
202D
Event Queue
218
Pattern Matcher
210
210A
Client
210B
Client
210C
Client
210D
Client
212
Desktop Applications
212A
Word Processor
212B
Email
212C
Browser
212D
Instant Messenger

Figure 2

Phone Numbers	123-456-7890 123 456 7890 123456 7890 123456-7890 123-4567890 1234567890 123-4567 1234567 (123)456-7890 (123) 456-7890 (123) 456 7890 (123) 4567890
Instant Messenger	messenger ID, full name Messenger ID, Full Name
City Names	city names
Zip Codes	Zip codes in standard zip and zip+4 format
Local Queries	'restaurant' + (City Name or Zip Code) 'Restaurant' + (City Name or Zip Code) 'restaurants' + (City Name or Zip Code) 'weather' + (City Name or Zip Code)
Package Tracking information	UPS 1z9999999999999999 Fed Ex USPS 7000 0000 0000 0000 0000
Addresses	Use address matching technology to identify US addresses.

Figure 3

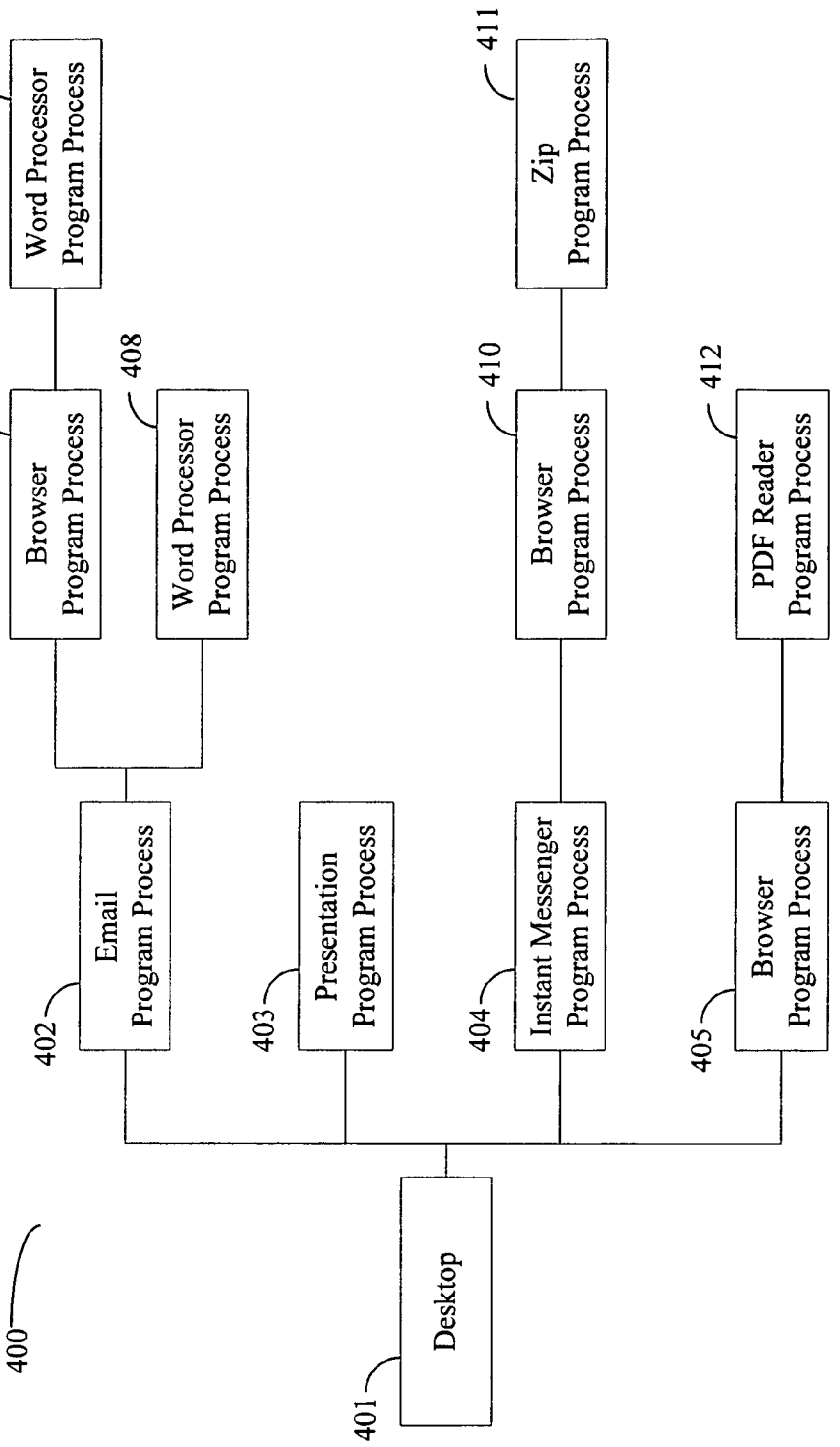

400
Desktop
401
Email Program Process
402
Presentation Program Process
403
Instant Messenger Program Process
404
Browser Program Process
405
Browser Program Process
406
Word Processor Program Process
408
Word Processor Program Process
409
Browser Program Process
410
Zip Program Process
411
PDF Reader Program Process
412

Figure 4A

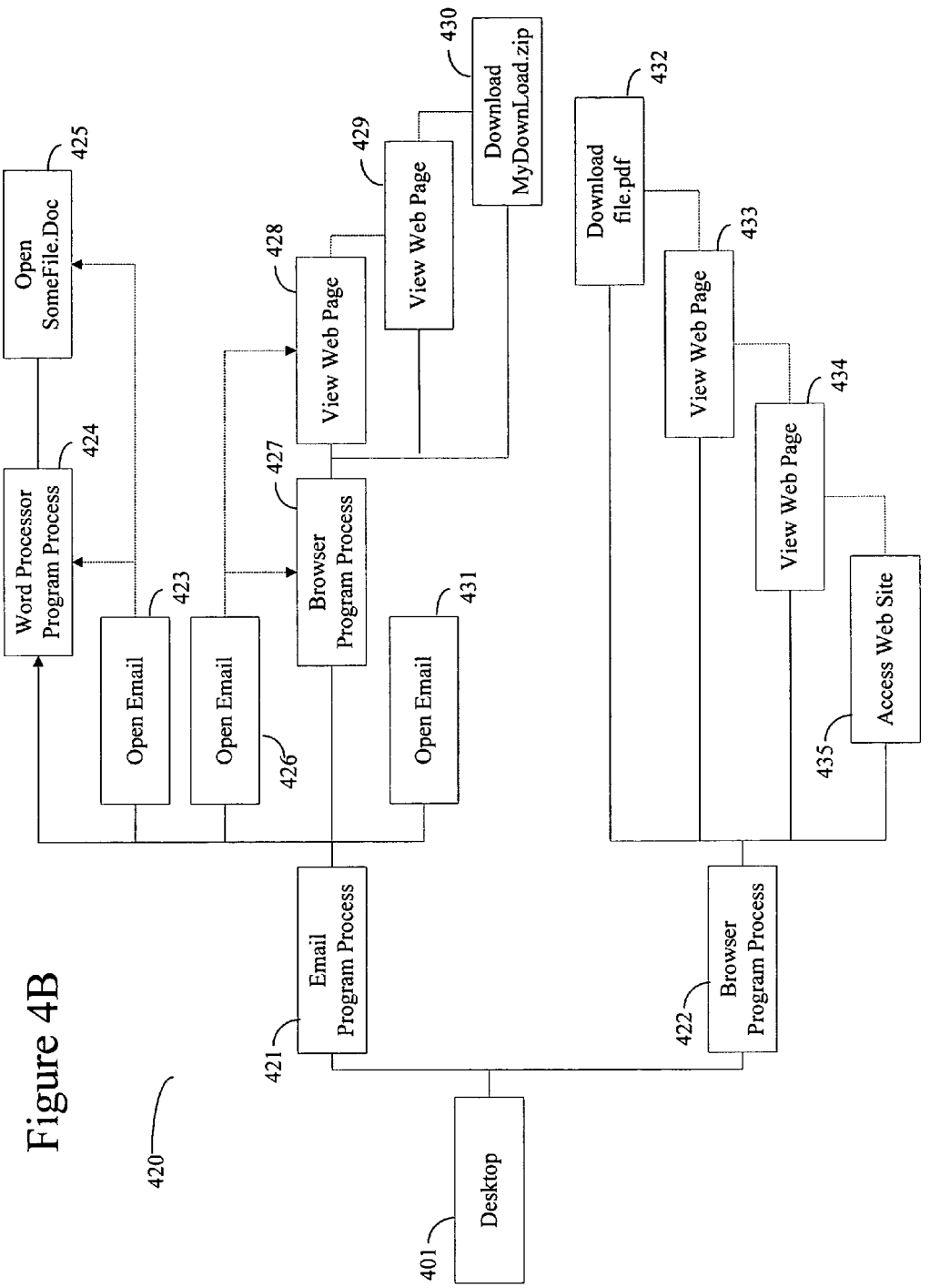

Desktop
401
Email Program Process
421
Browser Program Process
422
Word Processor Program Process
424
Open SomeFile.Doc
425
Open Email
423
Open Email
426
Open Email
431
Browser Program Process
427
View Web Page
428
View Web Page
429
Download MyDownLoad.zip
430
Download file.pdf
432
View Web Page
433
View Web Page
434
Access Web Site
435
420

Figure 4B

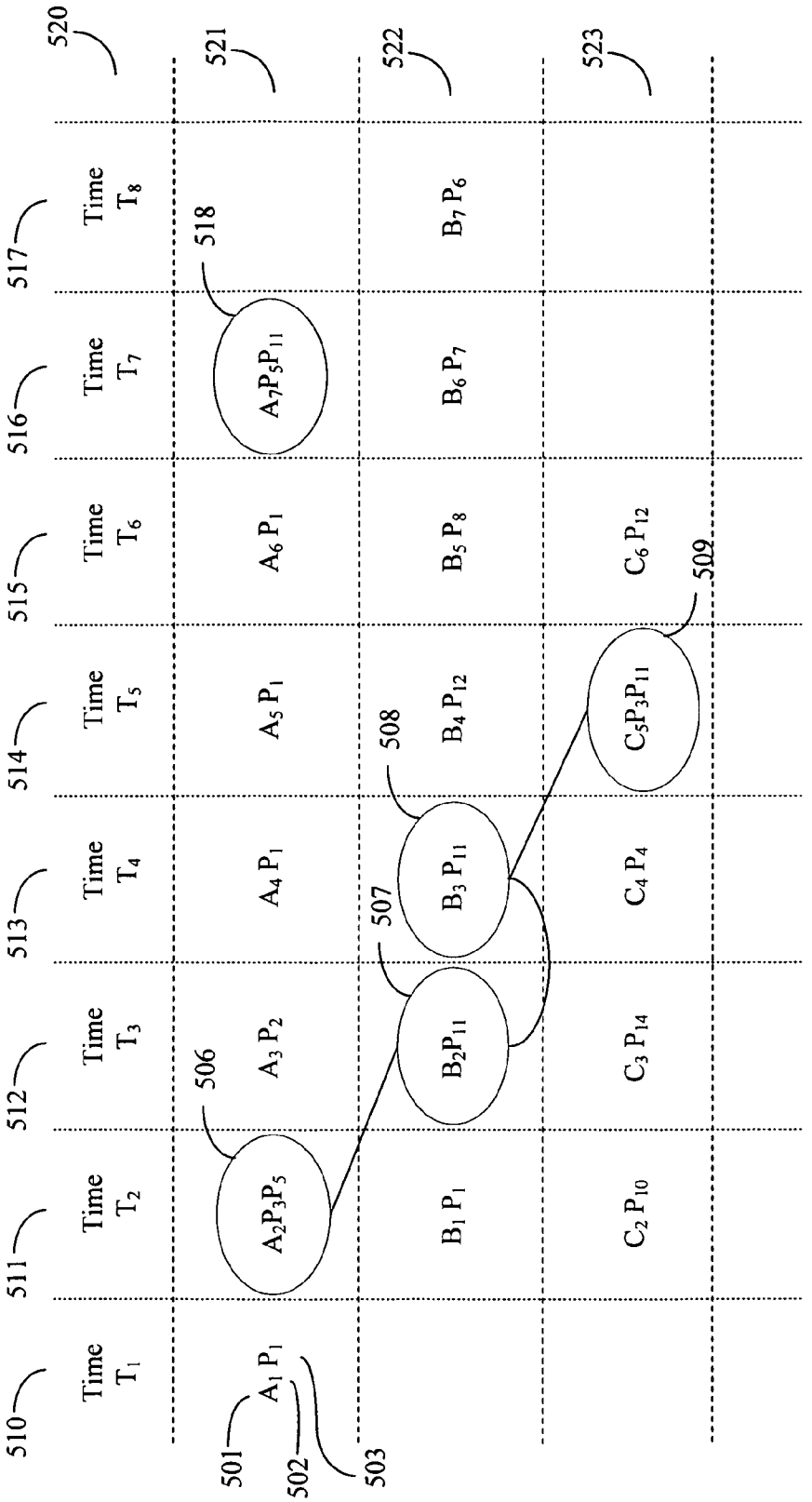

510
511
512
513
514
515
516
517
520
521
522
523
Time T1
Time T2
Time T3
Time T4
Time T5
Time T6
Time T7
Time T8
A1 P1
A2P3P5
A3 P2
A4 P1
A5 P1
A6 P1
A7P5P11
B1 P1
B2P11
B3 P11
B4 P12
B5 P8
B6 P7
B7 P6
C2 P10
C3 P14
C4 P4
C5P3P11
C6 P12
501
502
503
506
507
508
509
518

Figure 5

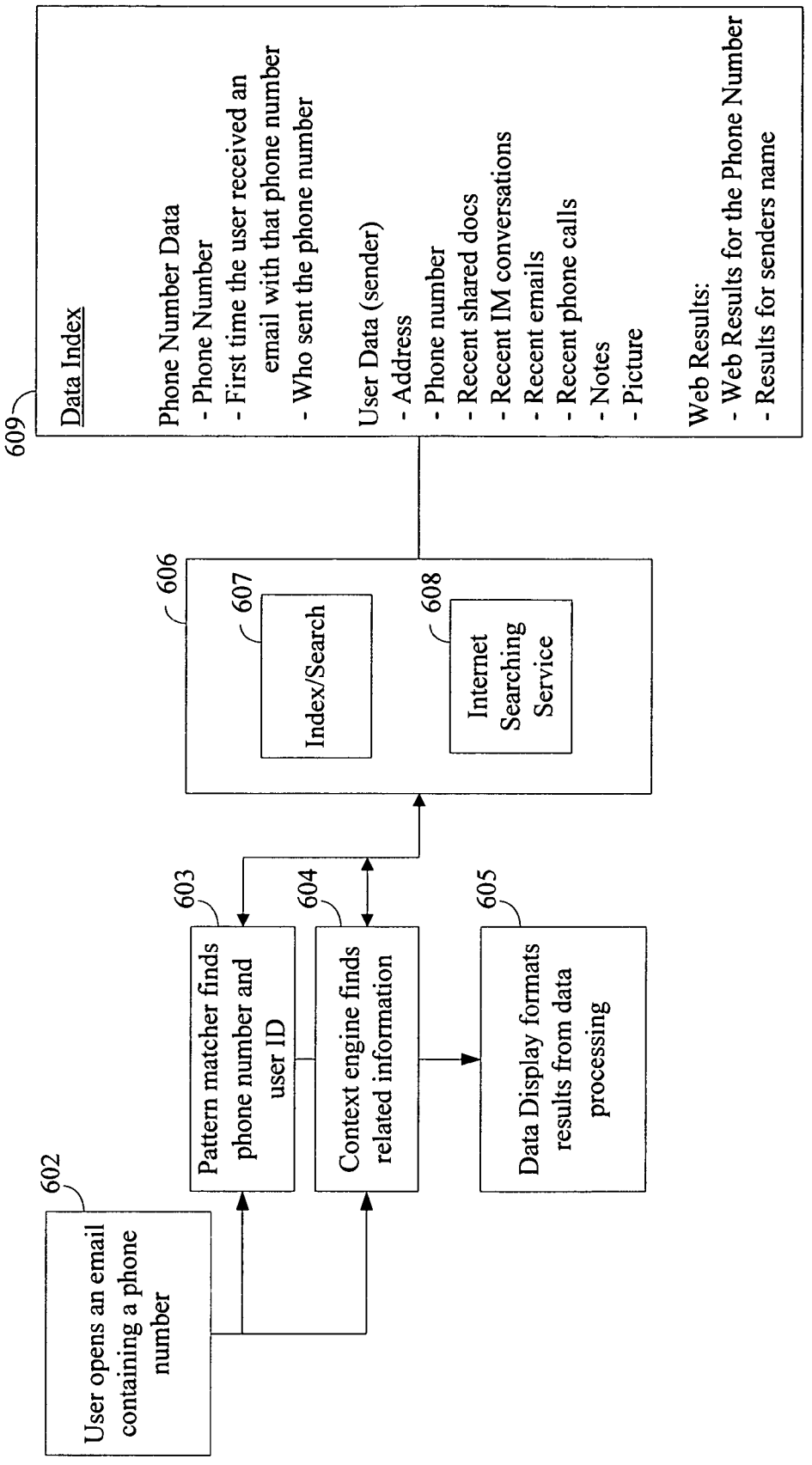

602
User opens an email containing a phone number
603
Pattern matcher finds phone number and user ID
604
Context engine finds related information
605
Data Display formats results from data processing
606
607
Index/Search
608
Internet Searching Service
609
Data Index
Phone Number Data
- Phone Number
- First time the user received an email with that phone number
- Who sent the phone number
User Data (sender)
- Address
- Phone number
- Recent shared docs
- Recent IM conversations
- Recent emails
- Recent phone calls
- Notes
- Picture
Web Results:
- Web Results for the Phone Number
- Results for senders name

Figure 6

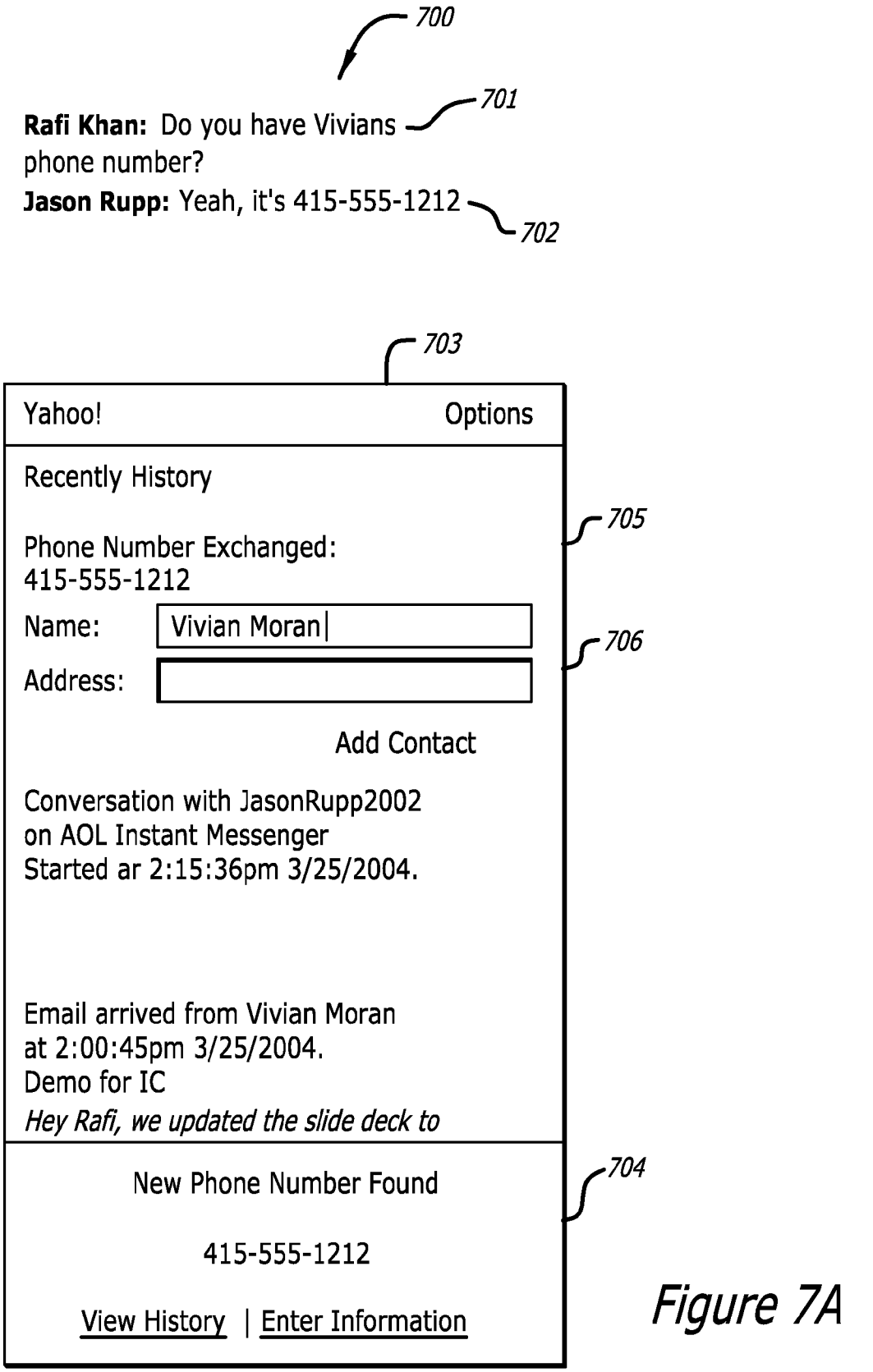
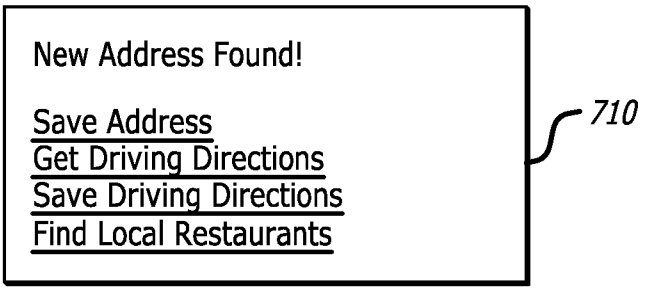

700
701
Rafi Khan: Do you have Vivians phone number?
Jason Rupp: Yeah, it's 415-555-1212
702
703
Yahoo!
Options
Recently History
Phone Number Exchanged:
415-555-1212
705
Name:
Vivian Moran
Address:
706
Add Contact
Conversation with JasonRupp2002
on AOL Instant Messenger
Started ar 2:15:36pm 3/25/2004.
Email arrived from Vivian Moran
at 2:00:45pm 3/25/2004.
Demo for IC
Hey Rafi, we updated the slide deck to
New Phone Number Found
704
415-555-1212
View History | Enter Information

Figure 7A

Figure 7B



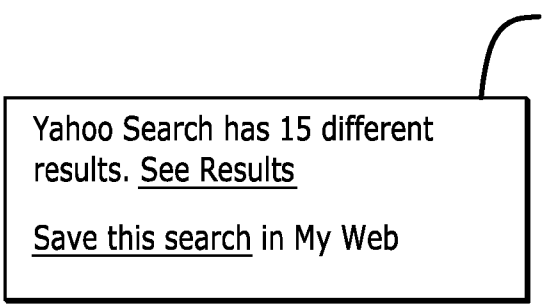
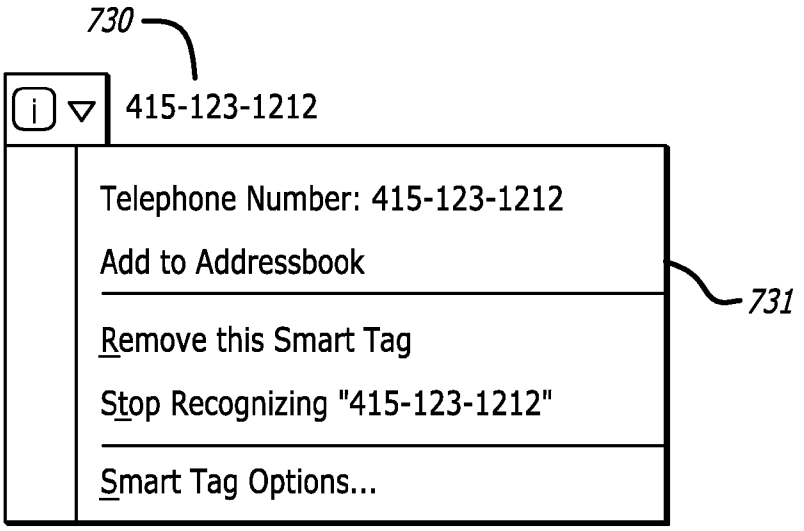


Figure 7C

Figure 7D



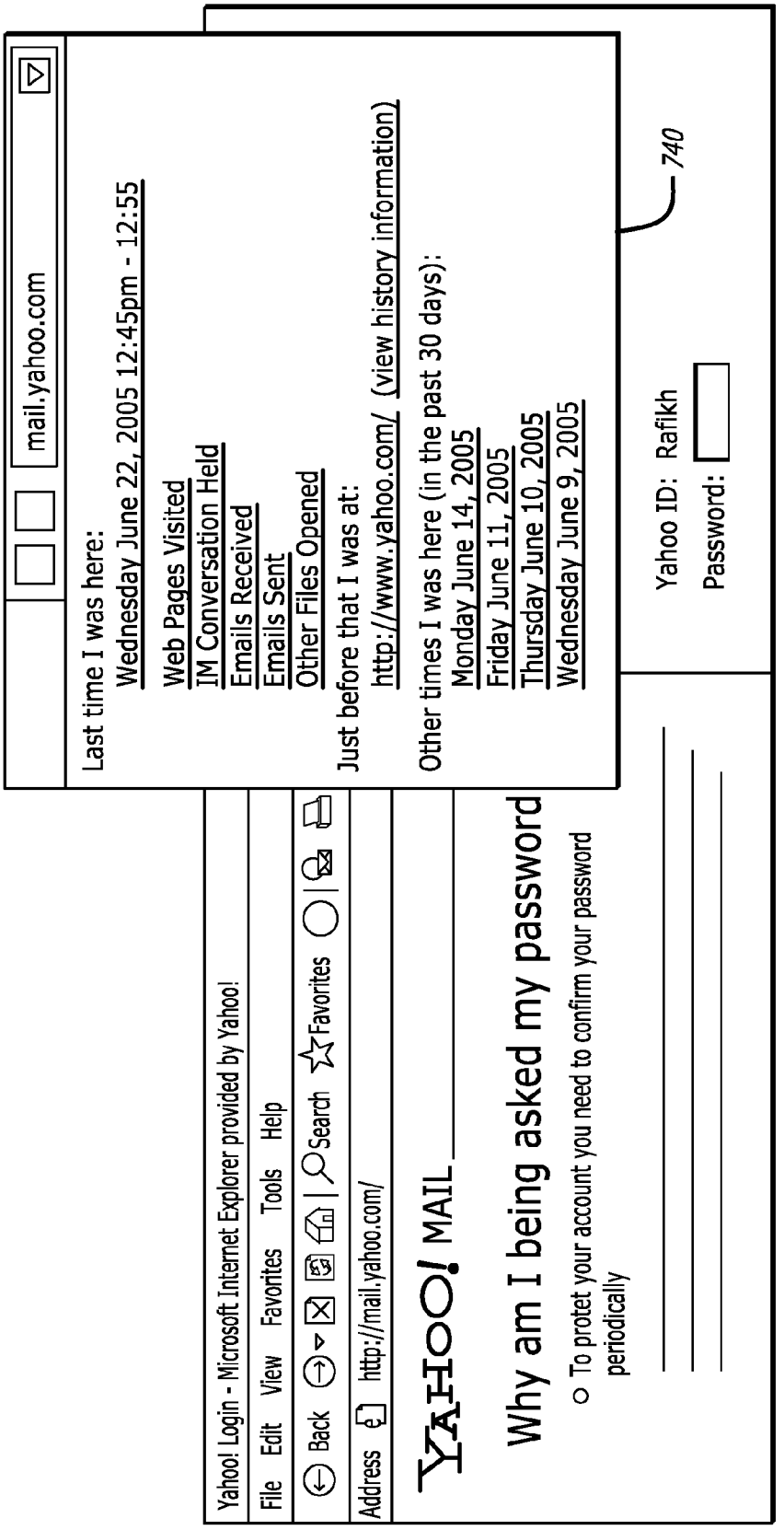

mail.yahoo.com
Last time I was here:
Wednesday June 22, 2005 12:45pm - 12:55
Web Pages Visited
IM Conversation Held
Emails Received
Emails Sent
Other Files Opened
Just before that I was at:
http://www.yahoo.com/ (view history information)
Other times I was here (in the past 30 days):
Monday June 14, 2005
Friday June 11, 2005
Thursday June 10, 2005
Wednesday June 9, 2005
740
Yahoo! Login - Microsoft Internet Explorer provided by Yahoo!
File Edit View Favorites Tools Help
Back Search Favorites
Address http://mail.yahoo.com/
YAHOO! MAIL
Why am I being asked my password
To protet your account you need to confirm your password periodically
Yahoo ID: Rafikh
Password:

Figure 7E

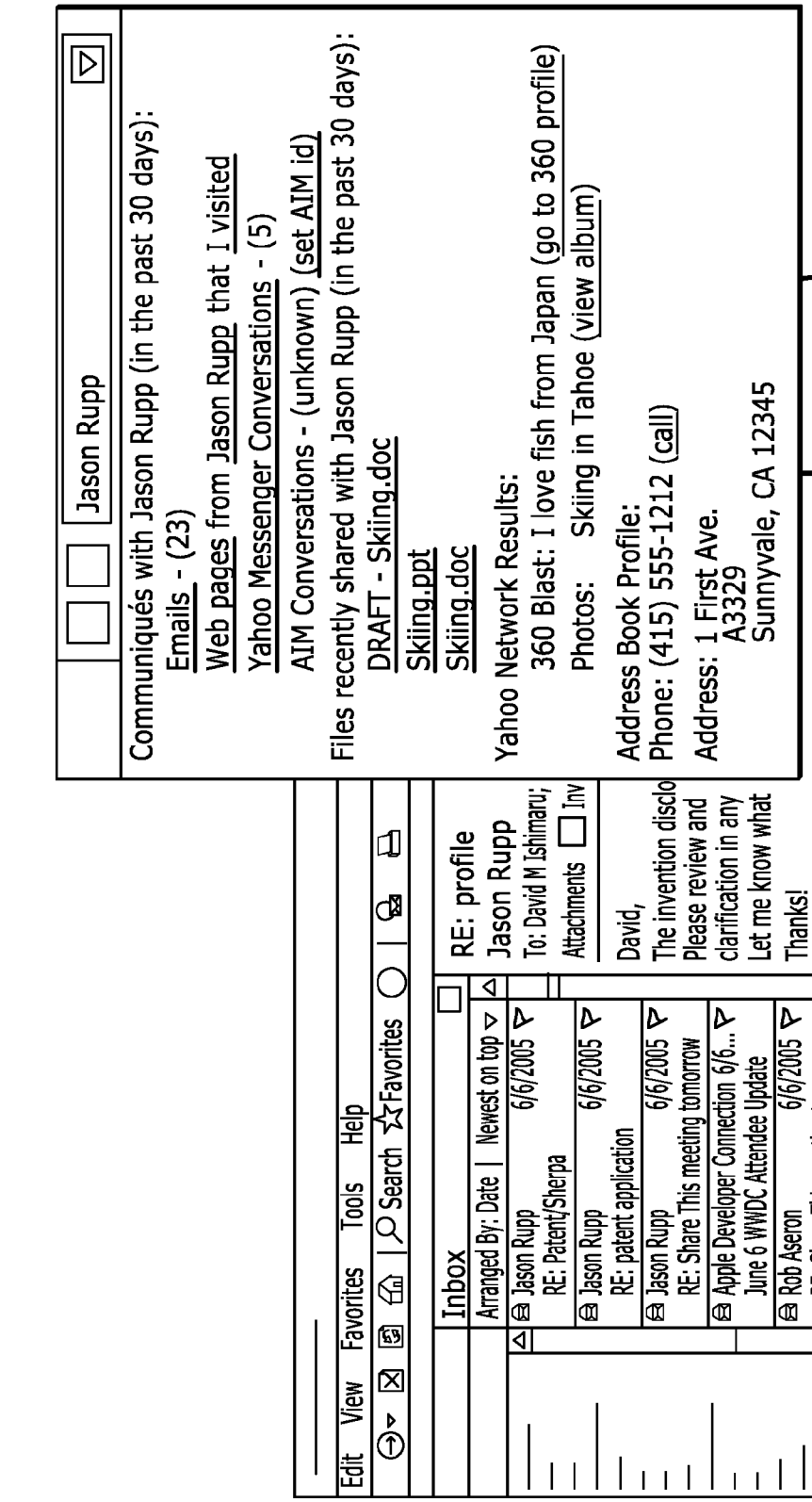

Jason Rupp
Communiqués with Jason Rupp (in the past 30 days):
Emails - (23)
Web pages from Jason Rupp that I visited
Yahoo Messenger Conversations - (5)
AIM Conversations - (unknown) (set AIM id)
Files recently shared with Jason Rupp (in the past 30 days):
DRAFT - Skiing.doc
Skiing.ppt
Skiing.doc
Yahoo Network Results:
360 Blast: I love fish from Japan (go to 360 profile)
Photos: Skiing in Tahoe (view album)
Address Book Profile:
Phone: (415) 555-1212 (call)
Address: 1 First Ave.
A3329
Sunnyvale, CA 12345
750
Edit View Favorites Tools Help
Search Favorites
Inbox
Arranged By: Date | Newest on top
Jason Rupp 6/6/2005
RE: Patent/Sherpa
Jason Rupp 6/6/2005
RE: patent application
Jason Rupp 6/6/2005
RE: Share This meeting tomorrow
Apple Developer Connection 6/6...
June 6 WWDC Attendee Update
Rob Aseron 6/6/2005
RE: Share This meeting tomorrow
Matt Leacook 6/6/2005
RE: Share This meeting tomorrow
Chris Moeller 6/6/2005
RE: Share This meeting tomorrow
RE: profile
Jason Rupp
To: David M Ishimaru;
Attachments Inv
David,
The invention disclo
Please review and
clarification in any
Let me know what
Thanks!
Jason
From: David M Ishimaru
Sent: Wednesday, May 04, 2005 11:25 AM

Figure 7F

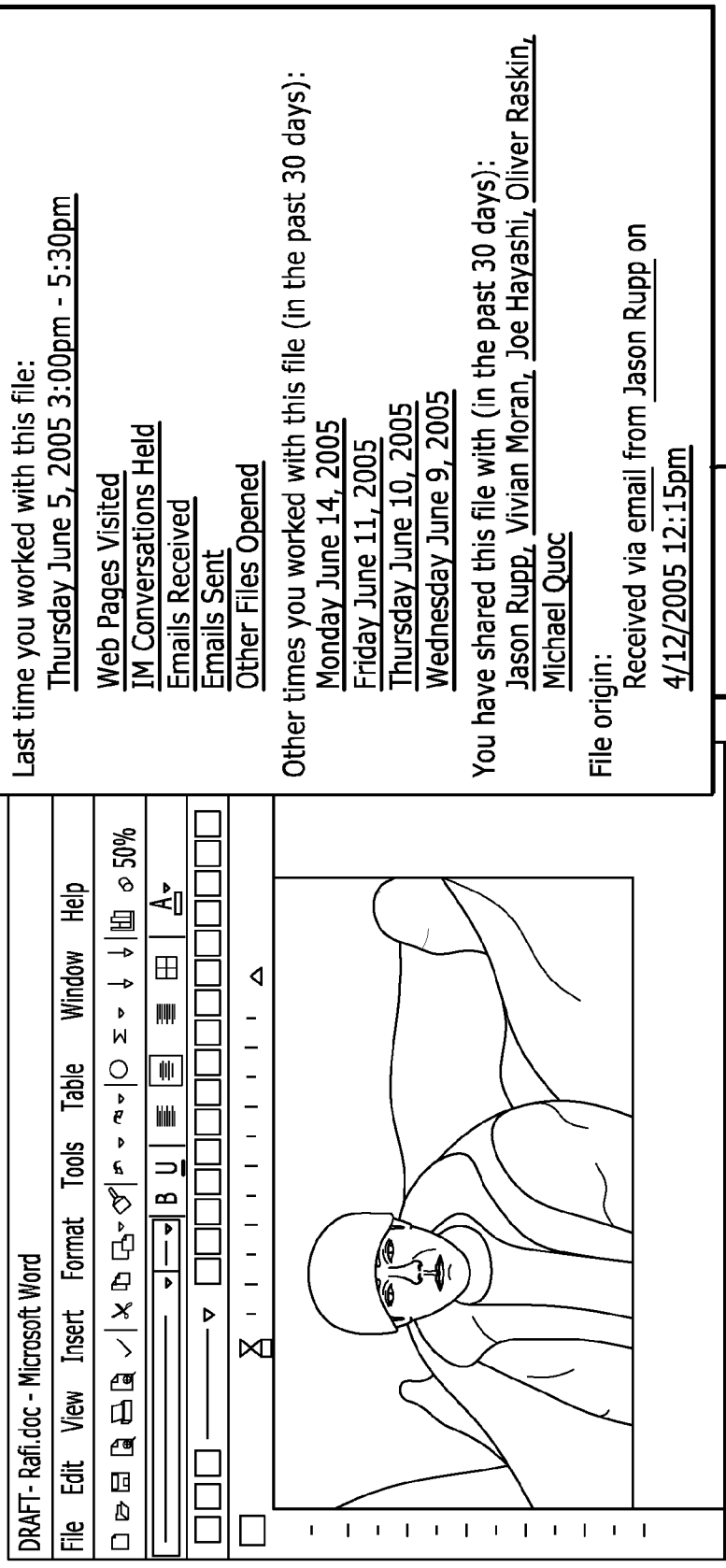

DRAFT- Rafi.doc - Microsoft Word
File Edit View Insert Format Tools Table Window Help
Page 1 Sec 1 1/2 At 1° Ln 1 Col 1 — TRK —
Draft - Rafi.doc
Last time you worked with this file:
Thursday June 5, 2005 3:00pm - 5:30pm
Web Pages Visited
IM Conversations Held
Emails Received
Emails Sent
Other Files Opened
Other times you worked with this file (in the past 30 days):
Monday June 14, 2005
Friday June 11, 2005
Thursday June 10, 2005
Wednesday June 9, 2005
You have shared this file with (in the past 30 days):
Jason Rupp, Vivian Moran, Joe Hayashi, Oliver Raskin,
Michael Quoc
File origin:
Received via email from Jason Rupp on
4/12/2005 12:15pm
760

Figure 7G

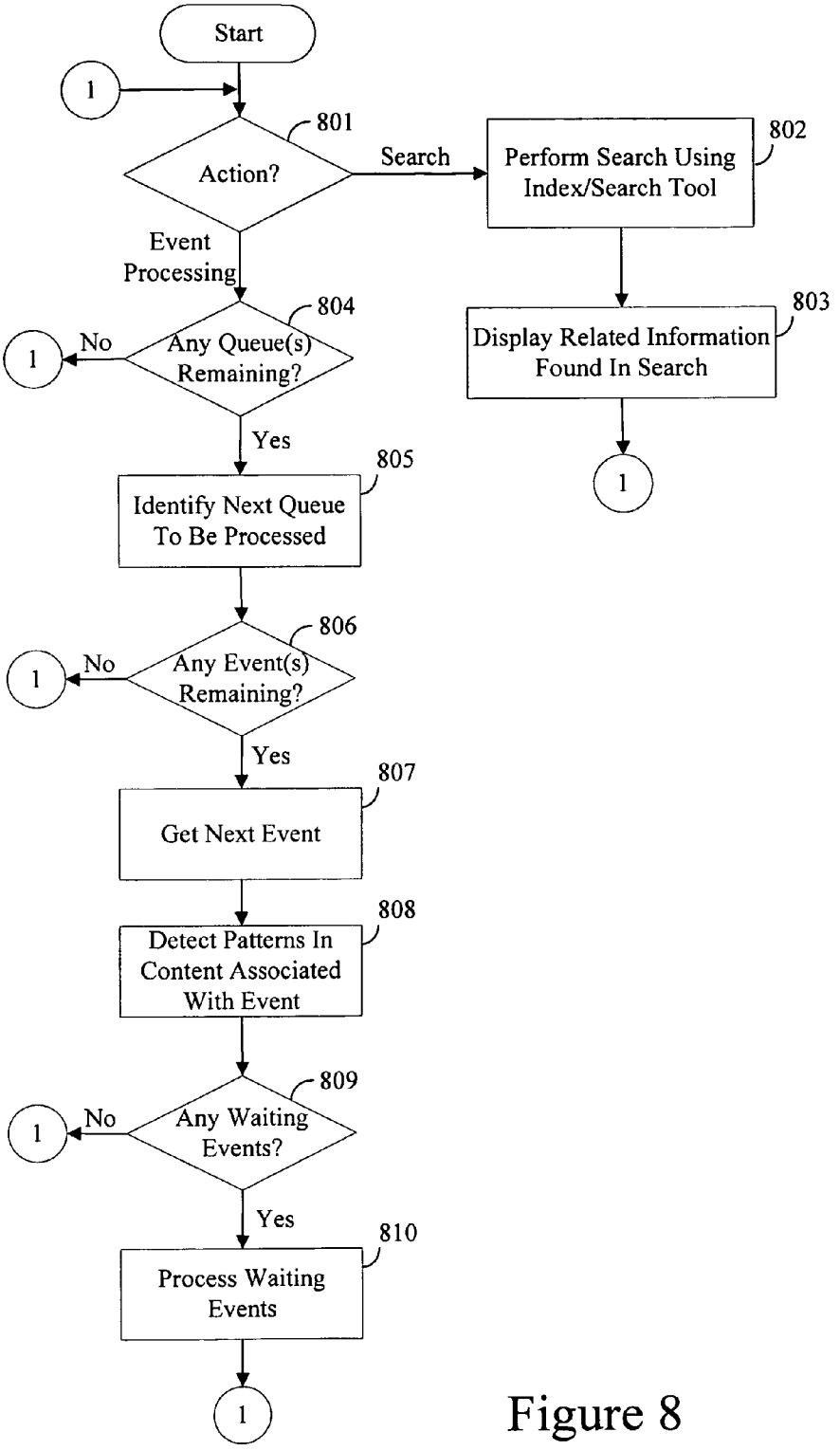

Start
1
801
Action?
Search
802
Perform Search Using Index/Search Tool
Event Processing
804
Any Queue(s) Remaining?
No
1
Yes
803
Display Related Information Found In Search
1
805
Identify Next Queue To Be Processed
806
Any Event(s) Remaining?
No
1
Yes
807
Get Next Event
808
Detect Patterns In Content Associated With Event
809
Any Waiting Events?
No
1
Yes
810
Process Waiting Events
1

Figure 8

SYSTEM AND METHOD FOR RECOGNIZING AND STORING INFORMATION AND ASSOCIATED CONTEXT

FIELD OF THE DISCLOSURE

The present disclosure relates to a system and method for context information associated with detected events, and more particularly to a system and method of recognizing occurrence of an event in a computing system, and identifying information associated with the event, including context information, which information can be stored for subsequent retrieval.

BACKGROUND

Computers are being used more and more to retain various types of information in electronic form. For example, computers can be used to store word processing documents, spreadsheets, correspondence (e.g., electronic mail and facsimile), contact information, calendars, instant messages, and the like.

In a conventional computer system, information is stored in one or more files maintained by a file system component of the computer system. A user can input a file name to retrieve the file (e.g., a file containing a word processing document) from the file system. However, many times a user cannot remember the file name, or even the context in which a file was used, for example Some software applications provide a listing of a limited number of the most recent files opened by the application in a listing when a user elects to open a file, in order to provide a shortcut for use in opening a file within the software application. If the file does not appear in this list, however, the user must use other means for identifying the file. For example, if the user remembers a portion of the file's name used to save the file, the user can search the file system to locate the file. A file system browse feature is typically available to the user from within a file open dialog screen, which allows the user to traverse the file system to locate the file. Alternatively, a user can use a search tool that resides on the user's "desktop". For example, Microsoft Windows® has a search tool, which allows the user to search based on a file's attributes, such as name, contents, location, modification date, data type. Once the file is located, it can be displayed for the user to select. Other search tools are available, such as the Desktop Search tool from Yahoo!®.

SUMMARY

The present disclosure seeks to address failings in the art and to provide a system and method for recognizing and storing context information associated with an information item.

Context information can comprise circumstantial information related to a previous experience with an information item, for example. Context information can be related to an event, e.g., in connection with an application program, the occurrence of which is connected to one or more information items, for example. By way of a further non-limiting example, an event, such as a process start, process stop, file (or other item) open, file (or other item) close, a spawned process, is identified, and information and context associated with the event is identified. For example, if a user is working in an electronic mail application, and receives an electronic mail message that has a word processing document as an attachment. If the user elects to open the attachment, embodiments of the present disclosure recognize the file open operation as an event and broadcast a message which contains information about the detected event, e.g., what applications were open at the time of the event, the fact that the file was received as an attachment to an electronic mail message, the sender of the electronic mail message, the recipients of the electronic mail message, the contents of the electronic mail message, the date of the electronic mail message, etc. Embodiments of the present disclosure store some or all of the information about the event, including context, or contextual, information. It should be apparent that the stored information can be used to subsequently identify the file. For example, the stored information can be used to identify a file that was received in an electronic mail message sent by "Jane Doe".

Context information can be used to identify an associated information item. By way of other non-limiting examples, context information can identify a person or system component involved in a process start/stop, information associated with a file (or other item) that is opened or closed, such as a file name, location, etc., information identifying a circumstance (e.g., reason) a new process is spawned, etc. The context information is indexed and related to information items, such that the context information can be used to identify one or more information items.

In accordance with one aspect, information and associated context are collected by monitoring at least one application program executable using the computing system, so as to detect one or more events associated with the at least one application program; identifying contextual information corresponding to the detected one or more events; and storing information associated with the at least one detected event, the stored information including the identified contextual information.

In accordance with another aspect, a system of collecting information and associated context comprising a plurality of clients, each client corresponding to an application program and operative to monitor its corresponding application so as to detect an occurrence of one or more events associated therewith; a context engine operative to identify context information corresponding to the detected one or more events; an index and search engine operative to store information associated with at least one detected event, the stored information including the identified contextual information.

DRAWINGS

The above-mentioned features and objects of the present disclosure will become more apparent with reference to the following description taken in conjunction with the accompanying drawings wherein like reference numerals denote like elements and in which:

FIG. **1**, which comprises FIGS. **1**A and **1**B, provides examples of information displayed in accordance with one or more embodiments of the present disclosure.

FIG. **2** provides an architectural overview in accordance with embodiments of the present disclosure.

FIG. **3** provides examples of pattern matching expressions used in one or more embodiments of the present disclosure.

FIG. **4**, which comprises FIGS. **4**A and **4**B, provides examples of context graphs in accordance with one or more embodiments of the present disclosure.

FIG. **5** provides an example of events and relationships based on time and pattern matches in accordance with at least one embodiment of the present disclosure.

FIG. **6** provides an example of a processing performed in accordance with one or more embodiments of the present disclosure.

FIG. **7**, which comprises FIGS. **7**A to **7**G, provide examples of displays provided in accordance with one or more embodiments of the present disclosure.

FIG. **8** provides an example of a process flow in accordance with one or more embodiments of the present disclosure.

DETAILED DESCRIPTION

In general, the present disclosure system and method for recognizing, storing, and retrieving information and associated context information.

Certain embodiments of the present disclosure will now be discussed with reference to the aforementioned figures, wherein like reference numerals refer to like components.

In accordance with one or more disclosed embodiments, an event and associated context information are identified and stored. By way of non-limiting example, an event can be a process start, process stop, file (or other item) open, file (or other item) close, new process spawned. In a case that an event identifies that a process opened a file, for example, embodiments of the present disclosure save the name of the file, the program that opened the file, together with date and time that the file was opened. In accordance with embodiments of the present disclosure, this information might supplement information already identified and indexed, such as that the file was received as an attachment in an email received at a certain date and time from a certain user. Embodiments of the present disclosure build an index associated with items, e.g., a files, applications, etc., and context information associated with the information item, e.g., the file was received in an email from the certain user and was opened in a word processing application program on a certain date and time. By way of additional non-limiting examples, context information can comprise information identifying a person or system component involved in a process start/stop, information associated with a file (or other item) that is opened or closed, such as a file name, location, etc., information identifying a circumstance (e.g., reason) a new process is spawned, etc.

In accordance with one or more embodiments, as a user interacts with a software application, e.g., an instant messenger or electronic mail application, information such as an electronic mail address or an instant messenger identifier, phone number, postal address, message content, date and/or time, etc. are identified. If the information is new, embodiments of the present disclosure can be used to save the information. For example, in a case that the new information is identified as a phone number, the information can be saved as contact information in an electronic address book. In addition to saving the information, context information can be saved. For example, information about how the phone number came to be identified, e.g., it was contained in a communication received by an instant messenger application program from another user, whose identification information can be saved as context information associated with the phone number. Information identifying the circumstances surrounding the receipt of the phone number (e.g., the date and time the phone number was received, the other applications open at the time the phone number was received) can be associated with the contact information. This information, which is referred to as context information, can be used to subsequently search for the phone number. For example, a user can search for phone numbers received from a certain user, or via the instant messenger application, or when a given application program was open, or at a given date and time, or while viewing a given web site.

By way of another non-limiting example, as a user browses the web using a browser application, embodiments of the present disclosure can detect that a search is being performed, and can automatically provide the user with additional search results from other search engines. In addition and in accordance with disclosed embodiments, the user can be prompted to save search results, address and phone number information, and the details surrounding the information in the user's address book. In addition to this information, context information, e.g., how the user found the information, can be saved. The saved contextual information can be used to search for the saved information. For example, the user can search for phone numbers found on the internet, addresses found on a specific web site, or phone numbers found while using the browser software application.

In accordance with embodiments disclosed herein, an indexing and search engine is used to build an index of information items and associated context information, which index can be searched to locate information and associated context. For example, the indexing and search engine can be used to search for recent instant messenger conversations, or recent electronic mail messages, that were received while a given word processing document was open by a word processing application. The indexing and search engine can be invoked to perform a search requested by the user, or it can be automatically invoked without a request from the user. To illustrate the latter by way of a non-limiting example, a user might receive an instant message from another user, which message includes information determined to be a name of a third user. In accordance with one or more embodiments, the indexing and search engine automatically searches the index to locate any information associated with the third user, such as the third user's avatar or display image, names of files that were sent to or from the third user via email or via messenger and appointments scheduled with the third user, for example.

FIG. **1**, which comprises FIGS. **1**A and **1**B, provides examples of information displayed in accordance with one or more embodiments of the present disclosure. In the example shown in FIG. **1**A, a user is contacted via an instant messenger application. Embodiments of the present disclosure recognize the contacting user and display a small toast, or other display window, with information associated with the user. In accordance with at least one embodiment, the display window is configured so as to be displayed automatically without request by a user. In accordance with such an embodiment, context information can be automatically displayed to the user in connection with the display of an instant message in a window displayed by the instant messenger application, for example.

Recent instant message conversations with the contacting user are located via the index, as well as two files, two calendar appointments shared with the contacting user, and links to this information are displayed in the toast. The contacted user has the option to click on any of the three links to see the conversations, the files or the calendar appointments. The contacted user can also decide to find and view all the information using a more detailed display. For example, with reference to FIG. **1**B, the contacted user can elect to view additional information, such as recent conversations, related files, calendar appointments, and recent email. In accordance with one or more embodiments, the user can click on any of the items to see the information in full detail.

In accordance with one or more embodiments, contextual information can be associated with files as well as software application programs, such as word processing, browser, instant message, etc. software applications. The contextual information can be stored as metadata associated with, or as

part of, the file or application. File and application access times can be tracked, as well as the manner in which the file or application is invoked, the application that used a file, other applications that were open while a file or application was in use, websites visited while a file or application was in use and search terms used to find websites and information, etc. The context information can be used to locate the files and/or applications. For example, a phone number can be located based on a website on which the user found the phone number (or vice versa), find a document using the name of the sender that sent the document (e.g., via an instant messenger or electronic mail application), find a contact based on who provided the contact information to the user, find a file based on the software applications that were open at the time the file was sent, opened, received, etc., find information based on the website from which the information originated, etc.

In addition and in accordance with one or more embodiments, context information can be used to identify undesired or unwanted files or programs, e.g., spyware, virus etc. For example, if a user finds a suspicious file, the user can use context information associated with the file to determine how the file was introduced onto the user's system, e.g., to determine that the file was installed when the user opened an email from an unknown sender, or visited a website unfamiliar to the user. In accordance with one or more embodiments, a spyware detection program might access information stored in accordance with embodiments of the present disclosure to determine the circumstances under which a program was installed on a user's computer. For example, using context information, it is possible to determine whether or not the installation was performed by a website suspected/known to be the source of spyware, and report this to the user.

FIG. **2** provides an architectural overview in accordance with embodiments of the present disclosure. In accordance with one or more embodiments disclosed herein, system **200** operates in the background on a computing system, and is transparent to the computing system user. System **200** comprises event queue **202**, event wait list **204**, context engine **206** and indexing and search engine **208**. In accordance with one or more embodiments, indexing and search engine **208** are separate components. In accordance with at least one embodiment, each of desktop applications **210** has a corresponding event queue **202**, which event queue stores messages received from the corresponding application. Queued messages are processed by context engine **206**. Context engine **206** processes queued messages to identify information and relationships between the information (e.g., context information) to be indexed and/or stored by indexing and search engine **208**. In accordance with one or more embodiments, the information can be stored in the form of metadata. Indexing and search engine **208** can be used to retrieve indexed information, such as information that provides context for a given item of information. For example, context engine **206** can store information which identifies the desktop application(s) **210** open when a given file was open using word processor **212**A. In addition and in accordance with one or more embodiments, context engine **206** generates a context graph, as discussed in more detail below.

In accordance with one embodiment, a client **210** is a component separate from the desktop application **210**, and operates in a manner transparent to the desktop application **210**. Client **210** monitors a desktop application **212** and detects an event associated with the desktop application **212**. If client **210** detects an event, it extracts information, e.g., information from the desktop application **212** and broadcasts a message as notification to system **200** of the event. The broadcast message can include an event type, information identifying the item for which context information is to be retained, and the context information, for example. In accordance with at least one embodiment, the message comprises a timestamp, a unique identifier, as well as other information associated with a given event (e.g., file name, content such as document, email instant message content, email address, instant messenger user identification). Of course, it should be apparent that other information, as well as other levels of detail of the information, can be passed to system **200**.

To illustrate by way of a non-limiting example, in a case that the event is a "file open" event (e.g., such as might occur with word processor **212**A), client **210**A can broadcast a message identifying the type of event (e.g., a "file open" event type), together with the name and location of the file opened by application **212**. To further illustrate, by way of a non-limiting example, in a case that the client **210** detects a new conversation in an instant messenger application **212**D, the message broadcast by client **210**D can include a "new conversation" event, together with the name of the person initiating the new conversation. In addition, the message can include the contents of the message. Another type of event that can be detected by client **210**D is a "new message" event. In such a case, the message broadcast by client **210**D can include the sender's identification as well as the contents of the message. By way of another non-limiting example, in a case of browser application **212**C, client **210**C can detect when the user opens a web site, and can broadcast a message as notification of such an event, together with the universal resource locator (URL) for the web site. In the case of email application **212**B, client **210**B can detect when a new email message is opened, and can forward a notification message, which includes the sender's email address, for example.

The messages from clients **210**A to **210**D are received into a corresponding event queue **201**, e.g., event queues **202**A to **202**D, and are processed by context engine **206**. In addition, pattern matcher **218** can parse information associated with an event, e.g., content in a message received from a client **210**. Context engine **206** retrieves messages from event queue **202**, and identifies connections between events. Events can be tied together chronologically, by application (e.g., an event queue **202** consists of events from a given desktop application **212** in accordance with at least one embodiment), or based on a pattern of information identified by pattern matcher **218**, for example. As discussed above, events are assigned a unique number, or globally unique identifier ("GUID"), and each event has a timestamp, e.g., a time that the event's message is broadcast by client **210**. System **200** can use a timestamp to connect events across applications, for example.

System **200** can request pattern matcher **218** to scan content to identify a pattern (e.g., URL, postal address, phone number, etc.). In accordance with one or more embodiments, pattern matcher **218** uses a library of regular expressions that it accesses, and then parses received information to identify a pattern. A regular expression is a language that can be used to describe a pattern (e.g., phone number, zip code, date, URL, address, UPC, MP3/IP3 tag, etc.). FIG. **3** provides examples of pattern matching expressions used in one or more embodiments of the present disclosure. Of course, it is recognized that one can define a regular expression, or other type of expression syntax, to find any pattern by describing the characteristics of the pattern using the expression syntax, and that any pattern so-defined can be added to the library used by the pattern matcher **218** to locate patterns. Patterns need not be limited to text, and can include images, digital audio, digital video, for example. In accordance with one or more embodiments, pattern matcher **218** can be instructed to dynamically create a regular expression to define a new pattern. For

example, client **210** can detect a command (e.g., a key sequence or mouse button input), which an application, or application user, can instruct

Pattern matcher **218** can be invoked by other than context engine **206**. For example, client **210**, or a desktop application **212**, can request pattern matcher **218** to verify a piece of information, e.g., a phone number entered via the desktop application **212**. To illustrate by way of non-limiting example, a user can input a command (e.g., a right click mouse button) to request the pattern matcher **218** to verify information based on its pattern. Alternatively, information input by the user can automatically be verified, so that information entered by a user into an input field can be analyzed by the pattern matcher **218** to confirm that it has the correct format, for example.

System **200**, and context engine **206**, can use services **216**, such as search engine **216**A and address book **216**B. For example, context engine **206** can use search engine **216**A to identify context information for a given information item, e.g., search engine **216**A can be used to search the internet for information associated with a sender of an email. To further illustrate by way of non-limiting example, an address book **216**B can be used to identify an email sender's name, postal address and/or phone number. It should be apparent that other services **216** can be used by system **200**.

Context engine **206** analyzes events to identify information and related context information. In accordance with one or more embodiments, context engine **206** builds one or more context graphs based on the contents of event queues **202** to identify relationships and associated contexts. FIG. **4**, which comprises FIGS. **4**A and **4**B, provides examples of context graphs in accordance with one or more embodiments of the present disclosure.

Referring to FIG. **4**A, an example of a context graph is shown, which associates processes spawned by other processes. More particularly, process **401**, which corresponds to a windowing desktop such as Microsoft Windows®, is the root of context graph **400**. Events **402** to **404** correspond to an email program process (e.g., Microsoft Outlook®), presentation program process **403** (e.g., Microsoft PowerPoint®), instant messenger program process **404** (e.g., Yahoo!® Messenger) and browser program process (e.g., Microsoft Internet Explorer®) being spawned. Context engine **206** determines, using event queues **202**, that email program process spawned in event **402** spawned browser program process, which resulted in event **406**, as well as word processor program process (e.g., Microsoft Word®), which resulted in event **408**, and that the browser program process associated with event **406** spawned a word program process, which resulted in event **409**. In addition, context engine **206** can determine, using context graph **400**, that event **404** corresponds to an instant messenger program process being spawned, which instant messenger program process spawned browser program process, which resulted in event **410**, that the browser program process spawned zip program process (e.g., Microsoft WinZip) associated with event **411**, and that browser program process associated with event **405** spawned a document reader program process (e.g., Adobe Acrobat®), which resulted in event **412**. In addition and using context graph **400**, context engine **206** can determine what application programs are open at a given time. Thus, for example, it is possible for context engine **206** to determine what applications are open when an email is opened by email program process **402**.

In accordance with disclosed embodiments, context engine **206** can determine relationships between events occurring in different desktop applications, and identify context information associated with the related events.

FIG. **4**B provides an example of a context graph **420** which identifies events associated with spawned processes and items (e.g., files, emails, web pages, etc.) manipulated by the spawned processes. Events **421** and **422** correspond to an email program process and a browser program process being spawned from desktop **401**. Email program process of event **421** opens an email, "email opened" event **423**, spawns a word processor program process (which corresponds to event **424**), opens another email (which corresponds to event **406**), spawns browser program process (which corresponds to event **427**) and opens a third email (which corresponds to event **431**). Word processor program process (corresponding to spawned process event **424**), opens a document, "someFile.doc" (which corresponds to event **425**). Browser program process (which corresponds to event **427**), is used to view web pages ("open email" events **426** and **429**), and download a zip file ("download file" event **430**). Browser program process ("spawned process" event **422**) is used to access a web site (event **435**), view web pages, (events **433** and **434**) and download "file.pdf" (event **432**). Context graph **420** can be used by context engine **206** to identify that events associated with email program process **421** and word processor program process **424**, for example, are related, and that "somefile.doc" opened via word processor program process **424** is related to email **423** opened by email program process **421**.

In accordance with one or more embodiments, context engine **206** can associate events in one or more events queues, and can relate events and items across desktop applications **212**. More particularly, in accordance with one or more embodiments, context engine **206** determines relationships between events and items corresponding to different desktop applications, using one or more context graphs, e.g., context graph **420**, and an event wait list ("EWL") **204** of FIG. **2**.

For example, when email program process (event **421**) spawns word processor program process (event **424**), e.g., in response to the user selecting a link from within an email message (e.g., which corresponds to "email open" event **423**), the client **210** associated with email program process (event **421**) notifies context engine **206**, by way of an "event waiting" notification. In response to the "event waiting" notification, an entry is created in EWL **204** which indicates that context engine **206** should expect to receive a "file open" event from a word processor program process, e.g., word processor program process (event **424**) spawned by email program process (event **421**), in connection with the opening of the "someFile.doc" file (event **425**). When a word processor program process (event **424**) is spawned in response to operations occurring in connection with the email program process (the spawning of which corresponds to event **421**), the email program's client **210** forwards the "spawned process" event (event **424**) to its event queue **202**. When the client **210** associated with word processor program process sends an event message notifying context engine **206** of the occurrence of an "open file" event (event **425**) in connection with the word processor program process ("spawned process" event **424**), which event is stored in event queue **202**, context engine **206** can relate the "open email" event **423** with the "open file" event **425** using the "event waiting" EWL **204** entry, and can associate the "someFile.doc" file **425** with email **423**.

In addition and by way of a non-limiting example, context engine **206** can further relate information contained in the email ("open email" event **423**) with the "someFile.doc", as well as information for which pattern matcher **218** has iden-

tified a valid pattern (e.g., a valid sending email address). Context engine **206** can use index and searching engine **208** to retrieve additional information (e.g., name, address, company, phone number, etc.) of the sender based on the sending email address, e.g., using address book **216**B, for example. In addition, context engine **206** can retrieve information from the subject line of the email **423**, and/or the body of the email **423**, for association with the file **425**.

To further illustrate, by way of non-limiting example, context engine **206** can use EWL **204** to determine that the "myDownload.zip" file ("download file" event **430**) was downloaded as a result of email (event **426**) being opened, browser program process being spawned (event **427**), and web pages being opened (events **428** and **429**). For example, when the client **210** associated with spawned email program process (event **421**) detects that a user has selected a hyperlink to a web page, client **210** can send an event message corresponding to this event, as well as an "event waiting" message to notify context engine that it should expect an "open web page" event from a browser program process spawned by the email program process. In addition, the client associated with the spawned browser program process ("spawn process" event **427**) detects events corresponding to viewing web pages **428** and **429** and downloading "myDownload.zip" file **430**, and forwards these events to event queue **202**. The EWL **204** entry created in response to the "event waiting" message can be used in connection with the contents of the event queues of the email and browser program processes to associate the web pages **428** and **429** and the "myDownload.zip" file with email **426**. Of course, as previously discussed, other context information (e.g., sender, subject, email message, etc.) can be extracted from the email **426** for additional context information. Indexing and search engine **208** can be used to store associations between the context information and the spawned programs and/or items to which the context information is associated. By way of another non-limiting example, context engine **206** can use EWL **204** to-determine that the "file.pdf" was downloaded as a result of browser program process being spawned (event **422**), a web site being accessed (event **435**) and web pages being visited (events **433** and **434**).

Embodiments of the present disclosure can associate context information based on time and/or patterns. FIG. **5** provides an example of events and relationships based on time and pattern matches in accordance with at least one embodiment of the present disclosure. In accordance with one or more embodiments, a timestamp is associated with events in event queues **202**. The timestamp can identify the time that an event was sent by client **210** to system **200**, for example. Of course, in addition to, or as a replacement for, such a timestamp, it should be apparent that one or more other timestamps can be associated with an event. Each of columns **510** to **517** correspond to a time T_1 to T_8, respectively, of an event, and each of rows **521** to **523** correspond to an application. For example, event A_1P_1, in row **520** and column **510**, occurred at time T_1. Event A_1P_1 comprises elements **501** to **503**, which identify the application, "A" (e.g., word processor, instant messenger, browser, etc.), event identifier, "1", and a pattern identifier, "P_1".

In the example shown in FIG. **5**, each event has a corresponding pattern, P_n, which is identified by pattern matcher **218**. In accordance with at least one disclosed embodiment, pattern matcher **218** has identified the patterns for each of events **506**, **507**, **508** and **509**. Using this information, context engine **206** determines that events **506**, **507**, **508** and **509** are related. In the example, it is assumed that applications "A", "B" and "C" correspond to instant messenger, word processing and email programs, respectively, and that patterns P_3 and P_{11} correspond to an email address and a file name. In addition, it is assumed for the sake of this example, that event A_2, B_2, B_4 and C_3 correspond to an instant message being received, a document file being opened, the document file being saved, and an email message being sent, respectively.

Using this information, context engine **206** can determine that an email address sent by an instant messenger user, whose instant messenger identifier (e.g., which has a pattern P_5) is captured from event A_2, is used to send, in event C_5, a file, which was opened and then saved via events B_2 and B_3, respectively, to the email address received in event A_2. Context engine **206** can use the timeline shown in row **520** to identify a sequence of the events. In addition, the timeline can be used to expand or narrow the scope of the associations made by context engine **206**. For example, based on a detected pattern, P_5, of information, an instant messenger identifier is associated with event A_7. If the instant messenger identifier is the same for both events A_2 and A_7, context engine **206** can create an association to indicate that the user sent a message to the sender of the email message at time T_7, and further that the message included some reference to the file identified using the file name pattern P_{11}. However, context engine **206** can be limited to a predefined time span, which may exclude time T_7, in order to conserve resources, for example. In such a case, context engine **206** would capture the association between events **506** to **509**, but not the association between events **506** to **509** and event **518**. Of course, expansion/reduction of the time span used by context engine **206**, as well as other parameters which can be used to expand or reduce the scope of examination performed by context engine **206**, are trade offs, which can be based on an end user's desire to conserve resources, e.g., processing bandwidth and/or memory/disk space.

FIG. **6** provides an example of a processing performed in accordance with one or more embodiments of the present disclosure. The processing, which can be performed by system **200**, is in response to a user opening an email which contains a phone number, as shown in event block **602**. In response to the event, pattern matcher **218** parses the email to identify information that has a phone number pattern and information having a user identification (e.g., user name) pattern. Context engine **206** uses the information identified by pattern matcher **218** to find related information using information location tools **606**.

In the example shown, a data index **609** can include data stored in a local repository (e.g., memory of the user's computer, or accessible via a local area network), as well as remotely stored data (e.g., data stored on a remote server accessible via the internet). Context engine **206** uses a local index/search tool **607** to retrieve related information from a local repository. In addition, context engine **206** uses an internet search engine **608** to conduct one or more web/internet searches. The resulting data index **609** includes the phone number contained in the email opened by the user, together with information identifying the first time the user received email containing the identified phone number and identification of the individual that sent the phone number to the user. In addition, context engine **206** can be used to retrieve information about the email sender (e.g., address, phone number, files recently shared with the sender, dates and/or content of recent instant messenger conversations with the email sender, dates and/or content of recent emails with the sender, recent phone calls with the sender, notes taken in connection with the sender, and the sender's picture. Further still, context engine **206** can be used to conduct a web search to retrieve additional information based on information contained in the

data index **609** (e.g., the sender's phone and/or email address). The information identified by context engine **206** can be displayed to the user at block **605**.

In addition, context engine **206** can be used to store any new information in data index **608**. For example, if information is retrieved from a web search which is not included in the local repository, context engine **206** can be used to save the information to data index **609**. In accordance with one or more embodiments, the user is given an option to save some or all of the new information, as part of the user interface displayed in block **605**.

FIG. **7**, which comprises FIGS. **7**A to **7**G, provide examples of displays provided in accordance with one or more embodiments of the present disclosure. Display portion **700** is part of an instant messenger program user interface, which displays a portion of an instant messenger conversation. Instant message **701** requests an individual's phone number, and a reply instant message **702** provides a phone number. In accordance with embodiments of the present disclosure, pattern matcher **218** is used to recognize the phone number contained in instant message **702**. Display **703** is provided by system **200**, which alerts the user, in display portion **704**, that a new phone number was found in instant message **702**, and allows the user the option of viewing the history associated with the new phone number and/or entering additional information, e.g., a name and address associated with the phone number, in portion **706**. In response to entry of contact information associated with the phone number, system **200** performs a query using index/search tool **208**, and displays recent history in portion **705**, e.g., recent instant messenger and email messages.

Referring to FIG. **7**B, a dialog box **710** is displayed by system **200** in response to an address being entered in an input field of a web page displayed by a browser program, which address is entered to retrieve a map, for example. Pattern matcher **218** is used to identify the input as an address. Recognizing that the address was entered in a context of a web page provided by a "mapping" web site, system **200** provides dialog box **710**, which provides the user with an opportunity to save the address in an address book, obtain and/or save driving directions. In addition, system **200** provides the user with an opportunity to conduct another search using the address information input to find local restaurants.

In accordance with one or more embodiments, system **200** can recognize a search query entered by the user, use the user's query as input to another search engine, and compare the results of the latter search with that of the former. Dialog box **720** can then be displayed to notify the user that there are additional search results available, as well as to allow the user to save the search.

FIG. **7**D provides an example of a pull-down menu that is displayed by system **200** in response to detection of phone number input in a word processing program in accordance with one or more embodiments of the present disclosure. Pattern matcher **218** of system **200** is used to recognize the input as matching a phone number pattern. In response, system **200** displays menu **731**, which provides the user with an option to add the phone number to the user's address book.

FIGS. **7**E to **7**G provide examples of displays provided in accordance with embodiments of the present disclosure. Referring to FIG. **7**E, display **740** is provided by system **200** in association with a browser program, for example, and provides historical information associated with a given web page/site URL, e.g., last time the user visited the web page, as well as other web pages visited, instant messenger conversations held, emails received, emails sent, and other files opened, during the user's visit(s) to this web page. In addition, display **740** identifies the web page that was visited just prior to the user's visit to the current web page. The other times that the user visited this web page in the last thirty days is also provided in display **740**.

Referring to FIG. **7**F, display **750** is provided by system **200** in response to email received from the sender of a given email, for example, and provides a history of communications (e.g., other emails received from the sender, web pages associated with URLs received from the sender and instant messenger conversations with the sender) with the email sender in the last thirty days, files shared with the sender in the last thirty days, results of a network search (e.g., local and/or web search) using the sender's information (e.g., name, email address, etc.), and information retrieved from the user's address book using the sender's information.

FIG. **7**G provides an example of a display **760** which is displayed by system **200** in connection with a word processing program. Display **760** identifies the last time the user worked on the file, as well as web pages visited, instant messenger conversations held, emails sent and received, and other files opened the last time the user opened the current file. In addition, display **760** identifies the other times the user worked on the file in the last thirty days. Display **760** identifies other users with which the file has been shared, and the file's origin (e.g., the file was received via an email from another user on the specified date and time).

FIG. **8** provides an example of a process flow in accordance with one or more embodiments of the present disclosure. At step **801**, a determination is made as to whether an event is to be processed, or a search is to be performed by system **200**. To process events, processing proceeds to step **804** to determine whether any of queues **202** have events queued for processing by system **200**. If not, processing continues at step **801**. If there is at least one queue **202** that contains an event to be processed, processing continues to identify the next queue to be processed, and to ensure that the next queue has events remaining to be processed, at steps **805** and **806**. If the selected queue **202** has at least one event to be processed, processing continues at step **807** to retrieve the event from the queue **202**. At step **808**, pattern matcher **218** of system **200** is used to detect any patterns in the information processed. At step **809**, a determination is made whether or not there are any events waiting for the queued event, using EWL **204**. If so, processing continues at step **810** to process the EWL **204** entry. In either case, processing then continues at step **801** to process another action. In a case that the action is a search to be performed using system **200**, processing continues at step **802** to perform the search using index/search tool **208**, and to display the results of the search for the user at step **803**. Processing continues at step **801** to process any remaining actions.

Embodiments of the present disclosure can be platform specific or platform independent (e.g., Macintosh, Microsoft or Unix platforms).

In accordance with one or more embodiments, desktop applications **212** communicate with system **200** via clients **210** using any inter-process communication (IPC) mechanism. Examples of IPC mechanisms can include, without limitation, sockets, message queues, COM message exchange, and/or message posts to threads. Using an IPC mechanism and in accordance with one or more embodiments, desktop applications **212**, can broadcast, via clients **201**, information (e.g., events, context information, file contents and other information associated with files, etc.) to be indexed by system **200**. In addition, using an IPC mechanism, desktop applications **212** can receive a message from system **200** to confirm that the information was successfully received

and indexed by the system **200**. In accordance with one or more embodiments, the messages communicated between desktop applications **212** and system **200** are formatted in XML.

Using an IPC mechanism, a desktop application **212**, and its corresponding client **201**, can broadcast information about files that are opened, closed, and when new applications are spawned, as well as any other context information, for example. As discussed above, such messages can be stored in event queues **202**. In response to such messages, system **200** processes the received messages and identifies information as context information. In accordance with one or more embodiments, context engine **206** tags the context information with a timestamp and the application from which the information originated, and index and searching engine **208** stores the context information, so that it can be subsequently searched.

In accordance with one or more embodiments, context information, as well as other information, received from a desktop application **212** and processed by system **200** can be rebroadcast to one or more services **216** registered with system **200**.

In addition, as discussed above, information received from desktop applications **212** can be passed to pattern matcher **218** to determine whether the received information matches a predefined pattern known to pattern matcher **218** (e.g., phone number, postal address, email address, URL, etc.). If any information matching one or more predefined patterns is found, the information can be identified to services **216** as a type of information based on the matched patterns. The information forwarded to services **216** can be formatted in XML.

In accordance with one or more embodiments of the present disclosure, services **216** can be add-ons to system **200**, which can operate to take information, e.g., context information, and process it so as to return a result. System **200** can then take the result and forward the result to one or more of the desktop applications **212** registered to receive the type of result generated by services **216**. For example, a desktop application **212** can register itself with system **200** to receive internet search engine results, postal addresses, etc. In accordance with one or more embodiments, such information forwarded to desktop applications **212** is formatted in XML.

While the apparatus and method have been described in terms of what are presently considered to be the most practical and preferred embodiments, it is to be understood that the disclosure need not be limited to the disclosed embodiments. It is intended to cover various modifications and similar arrangements included within the spirit and scope of the claims, the scope of which should be accorded the broadest interpretation so as to encompass all such modifications and similar structures. The present disclosure includes any and all embodiments of the following claims.

What is claimed is:

1. A method comprising:

monitoring, by a computing system, a plurality of applications being executed by the computing system, to detect one or more events that occur with the applications of the plurality, each of the detected one or more events having a context;

identifying, by the computing system, the context and contextual information corresponding to the context of each one of the detected one or more events;

receiving, by the computing system, a notice in connection with a first application of the plurality that an anticipated event that is yet to occur with a second application of the plurality is expected, detecting a second event occurring with the second application, identifying the second event as the anticipated event noticed in connection with the first application, and making an association between the second event that occurred with the second application and identified as the anticipated event and a first event of the one or more detected events, the first event occurring with the first application; and

storing, by the computing system, information associated with each detected event, the stored information including the identified contextual information of the identified context of each detected event, the stored information identifying the association between the first and second events.

2. The method of claim **1**, wherein said step of monitoring is transparent to the applications.

3. The method of claim **1**, said step of storing information further comprising:

building, by the computing system, a searchable index, the index for use in retrieving the stored information associated with the detected events and the corresponding contextual information.

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

creating, by the computing system, a context graph comprising a node corresponding to each of the detected events.

5. The method of claim **1**, the method further comprising:

creating, by the computing system in response to receiving the notice in connection with the first application, an entry in an event waiting list for the anticipated event, the entry for use in identifying the second event as the anticipated event;

determining, by the computing system and using the entry in the event waiting list, that the second event is the anticipated event;

storing, by the computing system, as part of the contextual information an association between the first event that occurred with the first application and the second event that occurred with the second application.

6. The method of claim **5**, wherein one or more detected events occur between occurrence of the first and second events.

7. The method of claim **1**, wherein the step of identifying contextual information further comprises:

examining, by the computing system, information associated with a detected event to identify at least one pattern; and

extracting, by the computing system and from the information, at least one information item corresponding to an identified pattern.

8. The method of claim **7**, further comprising:

associating, by the computing system, two or more detected events based on a time of occurrence associated with each of the two or more detected events.

9. The method of claim **7**, further comprising:

associating, by the computing system, two or more detected events based on at least one pattern identified in connection with the information associated with the two or more detected events.

10. The method of claim **7**, wherein the at least one pattern is one of a time, date, universal resource locator, postal address and phone number.

11. The method of claim **7**, wherein the at least one pattern is defined using a regular expression.

12. The method of claim **7**, wherein each of the detected events has associated information identifying an application of the plurality, a time of the detected event and at least one identified pattern from information associated with detected event.

13. The method of claim 12, further comprising:

identifying, by the computing system, relationships between two or more detected events using at least a portion of the information identifying an application of the plurality, a time of the detected event and at least one identified pattern from information associated with the two or more detected events.

14. The method of claim 13, the step of identifying relationships between two or more detected events further using a predetermined time span.

15. The method of claim 14, wherein identifying relationships between two or more detected events using the information associated with the detected events and a predetermined time span further comprising:

identifying, by the computing system, a relationship between the two or more detected events using the contextual information associated with the detected events and the predetermined time span, the identifying being based at least in part on a determination whether the time of the two or more detected events falls within the predetermined time span.

16. A system comprising:

at least one computing system configured to execute:

a plurality of clients corresponding to a plurality of applications being executed by the computer system, each client corresponding to one application in the plurality of applications and being separate from the corresponding application, each client being operative to monitor the corresponding application to detect one or more events associated with the corresponding application, each of the detected one or more events having a context, the client being further operative to provide notice to a context engine that an anticipated event that is yet to occur with an application of the plurality is expected;

the context engine operative to identify the context and context information corresponding to the context of each one of the detected one or more events, the context engine further operative to receive, from a first application's client, a notice that an anticipated event that is yet to occur is expected with a second application of the plurality, receive, from the second application's client, a notice that a second event occurred with the second application, identify the second event as the anticipated event noticed by the first application's client, and make an association between the second event as the anticipated event noticed by the first application's client and a first event of the one or more detected events, the first event occurring with the first application;

an index and search engine operative to store information associated with each detected event, the stored information including the identified contextual information of the identified context of each detected event the stored information identifying the association between the first and second events.

17. The system of claim 16, wherein each client is operative to monitor its corresponding application in a manner transparent to its corresponding application.

18. The system of claim 16, said index and search engine is further operative to build a searchable index, the index for use to retrieve the stored information associated with the detected events and the corresponding contextual information.

19. The system of claim 16, said context engine further operative to create a context graph comprising a node corresponding to each of the detected events.

20. The system of claim 16, the context engine further operative to:

create, in response to receipt of the notice from the first application's client, an entry in an event waiting list for the anticipated event, the entry for use in identifying the second event as the anticipated event;

determine, using the entry in the event waiting list, that the second event is the anticipated event;

store as part of the contextual information an association between the first event that occurred with the first application and the second event that occurred with the second application.

21. The system of claim 20, wherein one or more detected events occur between occurrence of the first and second events.

22. The system of claim 16, further comprising a pattern matcher operative to examine information associated with a detected event to identify at least one pattern, said context engine is further operative to extract from the information at least one information item corresponding to an identified pattern.

23. The system of claim 22, wherein said context engine is further operative to associate two or more detected events based on a time of occurrence associated with each of the two or more detected events.

24. The system of claim 22, wherein said context engine is further operative to associate two or more detected events based on at least one pattern identified in connection with the information associated with the two or more detected events.

25. The system of claim 22, wherein the at least one pattern is one of a time, date, universal resource locator, postal address and phone number.

26. The system of claim 22, wherein the at least one pattern is defined using a regular expression.

27. The system of claim 22, wherein each of the detected events has associated information identifying an application of the plurality, a time of the detected event and at least one identified pattern from information associated with detected event.

28. The system of claim 27, said context engine is further operative to identify relationships between two or more detected events using at least a portion of the information identifying an application of the plurality, a time of the detected event and at least one identified pattern from information associated with detected event.

29. The system of claim 27, wherein said context engine is further operative to identify a relationship between two or more detected events using the information associated with the detected events and a predetermined time span.

30. The system of claim 29, wherein said context engine operative to identify a relationship between two or more detected events using the information associated with the detected events and the predetermined time span is further operative to identify the relationship between two or more detected events based at least in part on the time of the two or more detected events falling within the predetermined time span.

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