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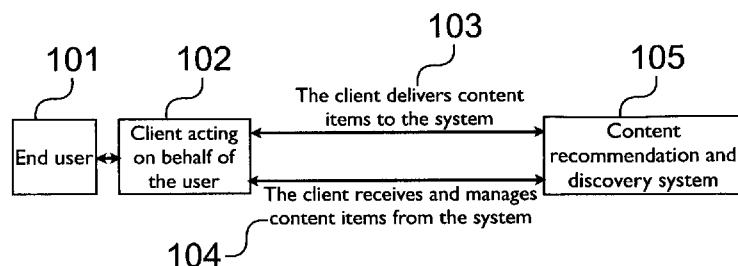


FIG. 1

(57) Abstract: Systems for recommending content can be implemented over messaging technology. Many instances of messaging technology support the ability of users to fetch and delete content items, and this is sufficient to provide information about the user's interest, or lack of interest in the received content, to a recommendation system. Oftentimes, the underlying messaging technology provides further signals. For instance, the electronic mail protocol IMAP (Internet Message Access Protocol) further allows users to mark content items as seen, flagged, answered, and forwarded. Given an incoming content item, with an associated intended recipient list, the system can make use of its knowledge of the users' interests, gathered through signals such as the aforementioned ones, to inform decisions on which of the intended recipients, or even new potential recipients not listed in the original recipient list, are to receive the content item.



# System and Method for Content Recommendation and Discovery Over Messaging Technology

## 5 CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation application of and claims the benefit of priority from EPO application number 14001810.2/EP14001810, entitled "A SYSTEM FOR CONTENT RECOMMENDATION AND DISCOVERY OVER MESSAGE COMMUNICATION TECHNOLOGY", and filed on May 23, 2014. The content of the aforementioned application is  
10 incorporated herein by reference in its entirety.

## TECHNICAL FIELD

Aspects of the disclosure relate to providing content recommendations. More specifically, aspects of the disclosure are directed to providing content recommendations over messaging technology.

## 15 BACKGROUND ART

A number of solutions have been proposed in the past to address the problems of finding potentially interesting content on behalf of a user, and/or filtering some of the content delivered to a user in order to avoid unsolicited, or undesired content. Among the earlier efforts are electronic mailing lists [3], to which users can subscribe to receive content from  
20 other users, and spam filters [7], which attempt to avoid delivering unwanted email messages to users.

Both problems cited above are addressed by recommendation systems [8]. Relevant prior uses of recommendation systems include the use of content recommendation technology for recommending music to users from a database of songs [2], the use of browser toolbars  
25 or extensions to provide users with recommendations and gather explicit webpage ratings from users [9], and the use of explicit and implicit viewing preferences for recommending television programs [4]. Perhaps closer to our invention is the work of [6], which makes use of the fact that, whenever two users are part of the same social network, the relation between them in the social network can be used to inform content recommendations.

30 In our invention, there is no need for users to belong to the same social network, and the signals used to inform the recommendation system do not have to be provided by explicit rating of items. Instead, the recommendation system makes use of information gathered during the normal use of a messaging system, such as which messages a user reads or deletes.

## DISCLOSURE OF INVENTION

35 **Motivation.** Many communication problems are well served by modern means of elec-  
tronic communication. For instance, email systems provide efficient asynchronous commu-  
nication, in which the recipient doesn't need to be connected to the delivery system, or to  
any network, in order to receive messages, which are stored and can be viewed at a later  
time. Other communication technologies, such as Instant Messaging (IM), require both  
40 communicating parties to be simultaneously connected to the same system to ensure that  
reception and viewing of messages by the user occurs rapidly. Other means of communi-  
cation, such as Multimedia Messaging Service (MMS) are akin to email, but operate over  
mobile networks. In a similar vein, Digital Video Broadcasting (DVB), and Digital Audio  
Broadcasting (DVA) technologies provide communication channels between distributors of  
45 video and audio, or simply audio content, and users, with similar goals of efficiency of  
delivery.

Although the above modes of communication may vary in their priorities in terms of  
quality of delivery, such as prioritizing efficiency of transmission, or reliability, their common  
feature is that, for each content item, once one or more intended recipients of the information  
50 are identified by the sender, the goal of the system is to deliver that information to the  
intended recipients.

By placing the choice of recipient often fully under the control of the sender, the above  
communication systems can suffer from two drawbacks:

1. Information that is of interest to a user may not arrive to that user. In this case the  
55 sender may not have included the interested user in the list of recipients for any of a  
number of reasons, for instance because the sender is unaware of the existence of this  
user.
2. Information that is *not* of interest to a user may nevertheless arrive to that user.

Note, however, that for personal communications between known parties, the above draw-  
60 backs typically become irrelevant, and many types of existing communication systems al-  
ready serve this form of communication well.

There have been a number of attempts to alleviate the above problems. Spam filtering [7]  
addresses drawback number 2 by filtering email messages incoming to a user, trying to  
detect and discard or quarantine those that are unsolicited or undesired (spam). Electronic  
65 mailing lists [3] allow users to subscribe to group communication channels, partly addressing  
drawback 1: a user subscribed to a mailing list will receive information from other users  
in the list, and some of those users may be unknown to him/her. Since mailing lists, or  
subscriptions lists in general, require users to explicit subscribe, participating users must  
first be aware of the existence of the list, and therefore this only partially addresses drawback  
70 1 above.

Other communication services, such as Twitter (from “Twitter Inc.”) and Facebook (from “Facebook, Inc.”), share some of the above problems when trying to alleviate the above drawbacks. Twitter is a service very much akin in spirit to subscription mailing lists, requiring explicit subscription to receive messages from a user. Facebook delivers information from confirmed contacts or other subscription-like sources requiring prior knowledge of their existence, and filters incoming content using a number of signals of interest in the information, including the user’s behavior in the system (for instance signals of interest in the information previously received from each of the contacts). This addresses drawback 2 above, but not drawback 1.

A natural approach to alleviating the above two drawbacks is to use a recommendation system [8] to inform the content item delivery decisions. We note that while recommendation systems require feedback from users in the form of ratings, many content delivery systems already provide at least basic means of managing content items, and this is sufficient to generate content rating information to be used by the recommendation system.

**Description of the invention.** Many content delivery systems, for example many email systems, provide means to fetch and to delete or archive content items, and possibly to flag them. These basic operations can be used as indicators of interest by a recommendation system. The recommendation system can provide content recommendations to users by having some control over the content item delivery decisions, for instance by replacing part or all of the original recipient list of a content item in favor of recommended recipients. Note that the recommended new recipients of a content item do not have to have any relation with the sender (in particular, there is no requirement for them to subscribe to any source of content). The system may decide to deliver a content item to any of the users, independently of whether the original content item creator included the address of that particular user as a recipient. In particular, this means that the system may add to the original recipient list an address that was not in the original recipient list, and was not in any group list referenced in the original recipient list. The decision of which content items are delivered to which users (possibly apart from the recipients that the content item author specifies) is made by the system based on its prediction of the interest the potential recipients may have in the content item. This prediction, which may be performed for instance using machine learning, or recommendation algorithms, is informed by, among other possible signals of interest, the user’s history of actions in the system (such as which content items the user chooses to delete, open, read, flag, replay to, forward, mark as draft, or archive). Since the recommendation system also attempts to filter out undesired content, we argue that this approach attempts to address both of the drawbacks listed in the motivation section.

From the point of view of the user, the described system is, in its more general form, a content delivery system in which content items can be sent to the system from either a

user of the system or from a user of an external system, content items are transmitted to the user, and content items can be managed by the user: the user may for instance open, delete, flag, reply to content items, forward content items, mark content items as drafts, or save content items to an archive, among others. The system gathers information about the user's operations on the content items, and these are treated as implicit signals of interest in the content item. Note that, by requiring no additional effort from the user than was already employed to manage content items, the gathering of so-called implicit ratings can be more convenient to the user, when compared to the requirement or suggestion that the user explicitly rate content items. Note, however, that we do not limit the described system to so-called implicit signals. As an example, we describe in section "Recommendation system based on email technology" a mechanism by which a system using the Internet Message Access Protocol (IMAP) can make use of special, client-defined message flags to allow users to explicit rate emails.

The skilled person should be aware that, for the analysis of the use of the system by a user, several timers may be applied with respect to the handling of content items. We mention here two timers of particular importance. One is related to the time passing from the moment that a user reads or fetches a content item, and a second one is related to the time between the reading or fetching of a content item, and the deleting, or other significant operation on the content item is performed.

**Distinction between content items stored at the client and at the server.** We note that different messaging systems may store the content items corresponding to a user in the system's servers, or in the user's client, or both. Whenever content items are stored in a user's client, and content item management (e.g. deleting a content item) is performed solely in the client, the client must be modified so that it notifies the system's servers of these user operations. In this case, the arrow numbered 104 in Figure 1 does not represent the communication between client and system's servers needed for the management of content items, but rather the notification from the client to the system's servers that the user has performed certain content item management operations.

**Sources of information to the recommendation system.** A number of sources of information may be used by the system, in order to inform its recommendations. These include, but are not limited to, the users' settings in the system, how frequently users access the system, for how long they remain connected, the time of day, or the day of the week, or other information regarding the time at which content items may be delivered.

Another source of information to the recommendation system may be the number of unread (or perhaps not marked as "Seen") content items associated with a user. The recommendation system may for instance choose to deliver only a limited number of content items to a user that has a sufficiently large number of unseen content items, with the aim to avoid overwhelming the user with too many unseen content items.

A source of information to the recommendation system may be whether a user requests (follows) a URL present in a content item. Note that, in order for the system to detect such a URL request, the system has to first replace the actual URL by a URL of the system, with an appropriate encoding of sufficient data to recover the original URL, as well as to identify the user, and possibly which content item the URL was placed in. The goal of such URL replacement is to intercept the request event, and send notification of the request to the recommendation system before redirecting the user to the actual destination URL. Since content items can often contain URLs that point to external content, requesting these URLs may be an indication by the user of interest in the content, and therefore knowledge of the request of such URLs can be useful to the recommendation system.

**Example of the operation of the system.** Consider, as an example of the operation of the system and its functionality, a user A who receives content items from two other users, B and C, and often deletes those from B, but rarely deletes those from C. The system receives notification of these deletion operations. The system may then use this information to infer that user A may be more interested in receiving content items from C than from B, and adjust accordingly its recommendation system to favor content items authored by C over those authored by B. Note that none of the above content items delivered to A necessarily had to initially include an address of A as a recipient in order for A to receive them, since the system can make delivery decisions that replace or simply modifying a content item's original recipient list.

**Relation between recommendation and messaging subsystems.** As has already been pointed out, the recommendation system herein described makes use of an underlying messaging technology, and at least a very basic means of content item manipulation, for instance fetching and deleting content items. The recommendation and messaging subsystems can relate in any of a number of ways.

It is possible to implement separate recommendation and communication and content item management systems, which communicate among themselves. In other instances, the two may be closely integrated. For instance, in the case that the underlying messaging technology is email, a specially-implemented email server may perform the tasks of content item delivery, management, and recommendation. Whether the recommendation and messaging subsystems are loosely or tightly integrated, their functionality from the point of view of the user is equivalent.

## BRIEF DESCRIPTION OF DRAWINGS

Figure 1 depicts the general structure of a content recommendation and discovery system based on a messaging technology. The system (105) communicates with the end users (101) via a client, which acts on behalf of the user (102). The client may send content

items to the system (103), and it may receive and manage content items by communicating with the system (104). In some cases in which content items are managed locally by a client on behalf of the user, the client may send notification of the management signals to the system.

Figure 2 depicts an embodiment of the system using email technology, and more in particular using the Simple Mail Transfer Protocol (SMTP), and the Internet Message Access Protocol (IMAP). The system (205) communicates with the end users (201) via a client, or Mail User Agent (MUA), which acts on behalf of the user (202). The client may send messages to the system using the SMTP protocol (203), and it may receive and manage content items by communicating with the system using the IMAP protocol (204).

## BEST MODES FOR CARRYING OUT THE INVENTION

The examples and described embodiments are not limiting, but merely illustrative. The invention is defined by the provided claims and equivalents thereof. It should be noted that the described embodiments may be combined in any way, i.e. the embodiments described in this document are not mutually exclusive, and features described in connection with a certain embodiment may be combined with features described in connection with another embodiment. The best mode for carrying out the invention is the one described in the section below ("Recommendation system based on email technology").

**Recommendation system based on email technology.** Email is a communication technology that has been in wide use for a several decades, and relies on well-established standard protocols of communication, such as SMTP, POP3, or IMAP. The role of an email messaging system is to receive, transmit, and manage messages. Crucially, a message contains a list of one or more intended recipients, and part of the task of the messaging system is to attempt delivery of the message to its intended recipients.

The recommendation system described in this document can be implemented using email communication technology as its underlying messaging technology. We describe here an implementation that uses SMTP and IMAP as communication protocols between user and system. We make reference to Figure 2. In this case, an end-user (201) makes use of a client, which is also referred to as a Mail User Agent (MUA) (202). The MUA communicates with the system on behalf of the user. The MUA may send messages to the system (205) through the Simple Mail Transfer Protocol (SMTP) (203). The SMTP protocol requires that these messages have an associated recipient list. The MUA receives and manages messages through the Internet Message Access Protocol (IMAP) (204). Note that the user may be a person or a computer, but this may be unknown to the messaging and recommendation system, which interacts with users only through the MUA.

The MUA may request messages delivered to the user to be fetched on behalf of the

user, and these fetching operations may change the **Seen** flag of a message. The user  
220 may execute management operations on the messages, such as opening, reading, flagging,  
replying, forwarding, deleting messages, or marking messages as drafts. Each of these  
operations have corresponding IMAP commands which the MUA sends to the messaging  
subsystem. The system then executes these operations, and keeps note of them for use in  
its recommendation subsystem.

225 The IMAP protocol has a number of features for managing messages that may be  
useful to the recommendation system. The recommendation system can keep track of these  
operations, as requested by the MUA, and incorporate this information to its computations  
in order to perform its task. Among these features may be the following:

- Messages may have internal flags (so-called system flags [1]) which can be set, cleared,  
230 or fetched, and may include the following: **Seen** (the message has been read), **Answered**  
(the message has been answered), **Flagged** (the message is “flagged” for urgent/special  
attention), **Deleted** (the message is marked “deleted” for later removal), **Draft** (the  
message has not completed composition: is marked as a draft). The “Flagged” flag is  
commonly depicted in clients (MUAs) as a flag icon or a star icon, and the flag itself  
235 is sometimes referred to as “Starred”.
- Messages may have user or *client-defined internal flags*. The IMAP protocol sup-  
ports the definition of new message flags other than the ones listed above (servers  
supporting new message flags advertise this fact to clients by sending “\\*” in a  
“PERMANENTFLAGS” response [1]). Manipulation of these flags may be used as  
240 signals by the recommendation system. As an example, a client may define and use a  
“positively-rated” flag. The client may provide a special button to mark any message  
as “positively-rated”, effectively providing the user with a means to explicitly rate  
messages.
- Messages may be copied to, moved to, or erased from a number of folders. Certain  
245 folders have special designations in the IMAP protocol using the “Special-Use Mail-  
boxes” extension [5]. For instance, the specially designated mailboxes may include  
those tagged in [5] as: **All** (typically a virtual mailbox including all messages, perhaps  
excluding those in Trash or Spam folders), **Archive** (for archiving messages), **Drafts**  
(typically used to store or list messages marked as **Draft**), **Flagged** (typically used  
250 to store or list messages marked as **Flagged**), **Junk** (typically used to store or list  
undesired or unsolicited messages, or those filtered by a spam filter), **Sent** (typically  
used to store or list sent messages), **Trash** (typically used to store or list messages  
that have been deleted or marked for deletion).

*Example recommendation subsystem.*

255 Consider the following, extremely simplified example implementation of a recommendation subsystem, and example use case. The recommendation subsystem simply receives information on user's actions in the system, and recommends content items to users.

Let A, B, and C be users of the system, using separate clients on behalf of each. The users may be physical persons or computers programs, but this makes no difference to the  
260 system, since it only communicates directly with the clients. Whenever we speak of a user executing an operation, it is understood that it's the user's client that communicates with the system in order to execute the operation.

We will consider how the system can make a decision on which content items to deliver to user A, with the understanding that similar decisions will be made for all other users.  
265 Let  $N_{B \rightarrow A}$  be the total number of content items authored by B that have been delivered so far to A. Similarly, let  $N_{C \rightarrow A}$  be the total number of content items authored by C that have been delivered so far to A. Let  $D_{B \rightarrow A}$  be the total number of content items authored by B that A has opened and deleted, and let  $D_{C \rightarrow A}$  be the total number of content items authored by C that A has opened and deleted. In this example, the system estimates the  
270 interest that A has in receiving a content item from B to be

$$P_{B \rightarrow A} = (N_{B \rightarrow A} + 1 - D_{B \rightarrow A}) / (N_{B \rightarrow A} + 1),$$

and similarly for C. This number is always between 0 and 1, with 0 representing no interest, and 1 representing very high interest.

Given the arrival of a content item authored by B, the system chooses to deliver this content item to A with probability  $P_{B \rightarrow A}$ . This probability of delivery will be low when the  
275 system believes that A is not very interested in receiving content items from B, and high when it believes that A is very interested in receiving content items from B.

Consider now the following sequence of events. User B begins by sending a content item MB1 to the system, and user C then sends content item MC1 to the system. Since at first it is  $N_{B \rightarrow A} = 0$ ,  $N_{C \rightarrow A} = 0$ , and  $D_{B \rightarrow A} = 0$ ,  $D_{C \rightarrow A} = 0$ , the initial system estimates of  
280 interest for A are  $P_{B \rightarrow A} = (0 + 1 - 0) / (0 + 1) = 1$  and  $P_{C \rightarrow A} = (0 + 1 - 0) / (0 + 1) = 1$ , and therefore the system estimates that A is very interested in receiving content items from both B and C. Due to the high estimated interest, content items MB1 and MC1 are delivered to A.

Later on, A connects to the system and fetches content items MB1 and MC1. A reads  
285 both content items and deletes MB1. The system updates its internal counts to  $N_{B \rightarrow A} = 1$ ,  $N_{C \rightarrow A} = 1$ , and  $D_{B \rightarrow A} = 1$ ,  $D_{C \rightarrow A} = 0$  (A received so far one content item from B and one from C, and deleted one content item from B and none from C), which leads to new estimates of interest  $P_{B \rightarrow A} = (1 + 1 - 1) / (1 + 1) = 0.5$  and  $P_{C \rightarrow A} = (1 + 1 - 0) / (1 + 1) = 1$ . Effectively, the system has noticed that A deleted the content item authored by B but not  
290 the one authored by C, and adjusted its estimates of interests accordingly, favoring C over

B.

As a consequence of A's behavior, future content items considered for delivery to A will be treated differently depending on whether they are authored by B or C. Content items from B will only be delivered to A with probability  $P_{B \rightarrow A} = 0.5$  (on average only 50% of them will be delivered to A), while all content items from C will be delivered to A.

As the users continue to use the system, the system will have more information on which to base its estimates of interest, and consequently to inform its delivery decisions.

**Recommendation system based on Short Message Service and Multimedia Message Service technology.** Both Short Message Service (SMS) and Multimedia Message Service (MMS) technology provide means for communication between mobile devices that is not based on voice, including sending text, images, and or audio or video files. While SMS and MMS technologies focus on the specification of recipients and delivery of messages, clients typically store the received messages and allow users to delete messages. As described above, this ability to receive, view, and delete messages is sufficient to implement a recommendation system that is based on an underlying message communication technology such as SMS or MMS. For example, the recommendation system can use the recommendation method described in the above section entitled "Recommendation system based on email technology", in combination with signals obtained as a side-effect of the users' management of messages (such as viewing, and deleting messages).

Note that, while email services based on the IMAP protocol typically store messages in the server and allow users to manage messages by use of the IMAP protocol, SMS and MMS services typically rely on the client to store and manage messages. Whenever a MMS user deletes a message, the deletion typically happens in the user's mobile client. This means that interest signals to be used in the recommendation system may need to be sent from the mobile client to the recommendation system, whenever this system is external to the mobile client, as would typically be the case.

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We claim:

1. A computer-implemented method for delivering content items to a first user comprising:
  - receiving, by a computing device, a content item sent by a second user;
  - 5 identifying, by the computing device, a list containing one or more addresses of intended recipients of the content item, wherein the list does not contain an address of the first user;
  - adding, by the computing device, to the list of intended recipient addresses, an address of the first user;
  - 10 delivering, by the computing device, the content item to each of the addresses in the modified list of recipient addresses, whether directly sending the content item to the corresponding user's client, or by sending the content item to another system for ultimate delivery to that address.
2. The computer-implemented method of claim 1, wherein the adding of an address of a user to the original list of intended recipients depends on the user's settings in the system.
3. The computer-implemented method of claim 1, wherein the adding of an address of a user to the original list of intended recipients depends on at least one of the following: the time of day, or the day of the week.
- 20 4. The computer-implemented method of claim 1, wherein the adding of an address of a user to the original list of intended recipients depends on at least one of the following: the frequency with which the user uses the system, or the number of times that the user uses the system over a predefined period of time.
- 25 5. The computer-implemented method of claim 1, wherein the adding of an address of a user to the original list of intended recipients depends on at least one of the following: information gathered by the system about whether that user follows one or more URL links referenced in a previously received content item.
6. The computer-implemented method of claim 1, wherein the adding of an address of a user to the original list of intended recipients depends on at least one of the following: information gathered by the system about the number of unread content items associated with the user, or the number of content items received and read over a predefined period of time.
- 30 7. The computer-implemented method of claim 1, wherein the second user is not a user of the content delivery system.

- 35      8. The computer-implemented method of claim 1, wherein the underlying content delivery technology of the system is email technology.
9. The computer-implemented method of claim 1, wherein the underlying content delivery technology of the system is Instant Messaging technology.
- 40      10. The computer-implemented method of claim 1, wherein the underlying content delivery technology of the system is Short Message Service technology or Multimedia Messaging Service.
11. The computer-implemented method of claim 1, wherein the underlying content delivery technology of the system is Digital Video Broadcasting technology.
- 45      12. The computer-implemented method of claim 1, wherein the underlying content delivery technology of the system is Digital Audio Broadcasting technology.
13. The computer-implemented method of claim 8, wherein the adding of an address of a user to the original list of intended recipients depends on information gathered by the system about the user's use history in the system, such as which content items users fetched, or which content items were marked as seen, or flagged, or deleted, 50 or answered, or drafted, or forwarded, or which content items users copied or moved to the Inbox folder, or to folders with the attributes Archive, Drafts, Flagged, Junk, Sent, or Trash.
14. The computer-implemented method of claim 8, wherein the adding of an address of a user to the original list of intended recipients depends on information gathered by 55 the system about the user's use history in the system, such as which content items the user marked using client-defined flags.
15. A computer system adapted to implement any of the preceding claims.

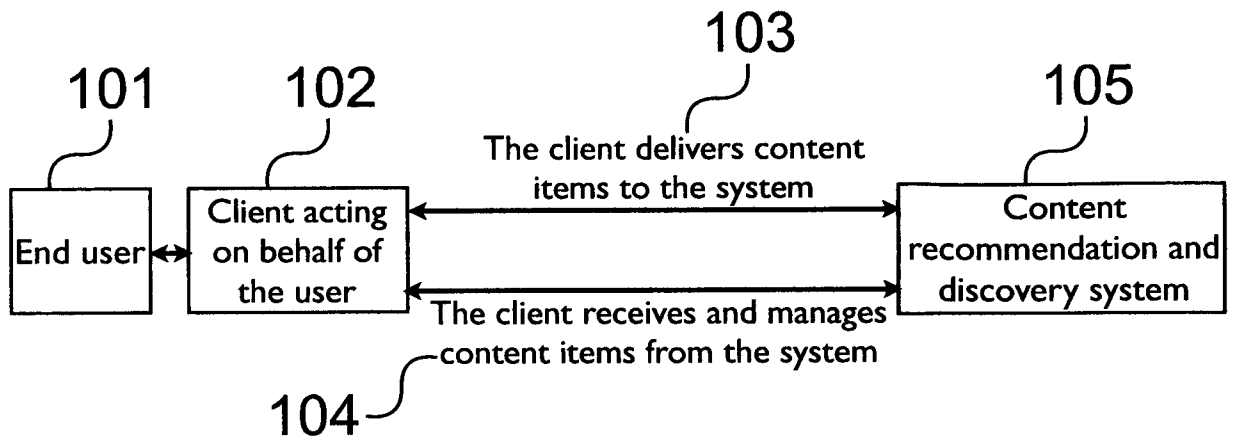


FIG. 1

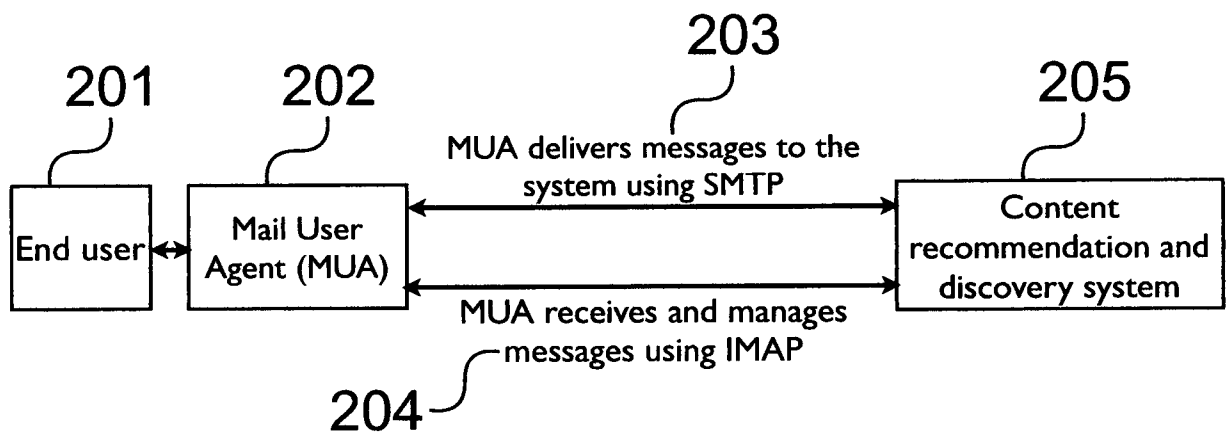


FIG. 2

## INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2015/001068

## A. CLASSIFICATION OF SUBJECT MATTER

INV. H04L12/58

ADD. G06F17/30 H04N21/45

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04L G06F H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2009/234876 A1 (SCHIGEL TIMOTHY [US] ET AL) 17 September 2009 (2009-09-17) paragraph [0028] - paragraph [0171]; figure 4	1-15
Y	----- US 2008/071872 A1 (GROSS JOHN NICHOLAS [US]) 20 March 2008 (2008-03-20) paragraph [0015] - paragraph [0052]; claims 1-16; figures 1-5	1-15
A	----- US 2014/067942 A1 (CARRIGAN WAYNE K [US] ET AL) 6 March 2014 (2014-03-06) paragraph [0028] - paragraph [0038]; figures 3-5  ----- -/-	1-15



Further documents are listed in the continuation of Box C.



See patent family annex.

## \* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&amp;" document member of the same patent family

Date of the actual completion of the international search

3 August 2015

Date of mailing of the international search report

11/08/2015

Name and mailing address of the ISA/

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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2015/001068

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>BIELENBERG K ET AL: "Groups in Social Software: Utilizing Tagging to Integrate Individual Contexts for Social Navigatio", MASTER THESIS</p> <p>16 August 2005 (2005-08-16), pages 1-120, XP001562272, Retrieved from the Internet: URL: <a href="http://users.cs.fiu.edu/~yzhan004/rectangularPacking/tagcloudRoud.pdf">http://users.cs.fiu.edu/~yzhan004/rectangularPacking/tagcloudRoud.pdf</a> page 30, paragraph 2.4.4 Recommender Functionality - page 32, paragraph 2.4.4.4 Implicit Measurement of Interest page 55, paragraph 3.3.4.1 Recommendation Engine - page 70, paragraph 3.4.5.1 Summary of Requirements</p> <p>-----</p>	1-15

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2015/001068

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US 2009234876 A1	17-09-2009	US 2009234876 A1 WO 2009114204 A2	17-09-2009 17-09-2009
US 2008071872 A1	20-03-2008	US 2008071872 A1 US 2011289171 A1 US 2013080556 A1 US 2013268609 A1 US 2015161118 A1	20-03-2008 24-11-2011 28-03-2013 10-10-2013 11-06-2015
US 2014067942 A1	06-03-2014	NONE	