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(54) Title: METHOD AND DEVICE FOR DYNAMICALLY UPDATING A LIST OF SEARCH RESULTS

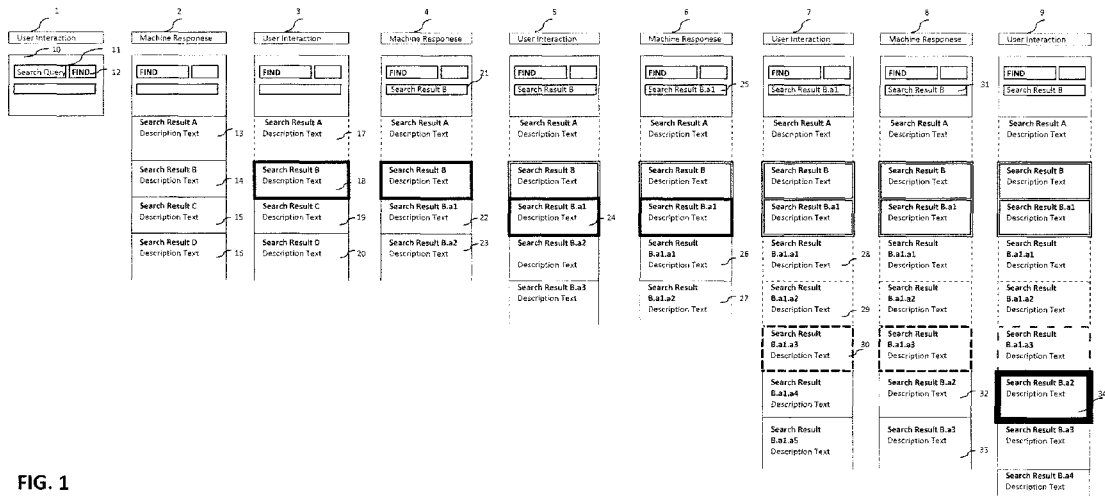


FIG. 1

(57) Abstract: The invention comprises a computer implemented method for dynamically updating a list of search results, comprising the steps: Receiving a first search query by a user; Executing the search query; Obtaining a list of search results, based on the search query; - Sending, at least partially, the list of search results to the user; Monitoring the user's interactions with the sent results; Creating a second search query, based on first search query and the monitored user interactions; Updating the list of search results, based on the second search query.

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METHOD AND DEVICE FOR DYNAMICALLY UPDATING A LIST OF SEARCH RESULTS

5 The present invention relates in general to the field of data search and retrieval. More particularly, this invention relates to the use of user behavior data for data search and retrieval.

TECHNICAL BACKGROUND AND PRIOR ART

10 It is well-known that most search queries that are input into information retrieval systems are not specific enough to define a set of search results that are each relevant to the user's interest. One reason for this is that most search queries are formulated ad hoc or by users that are not aware of the exact workings of the search algorithm of the information retrieval system. Modern search engines do also strive to provide an intuitive interface for users, thereby tending to reduce the complexity of inputting specific query information helpful in distinguishing relevant from irrelevant results. More particularly, the task of defining a query is reduced to the entry of one or more key words in a search box.

20 Even if the prior art systems gather data about the search activities of a single user to take his personal interests into account, the system fails if the user's interests change between search sessions.

The main obstacle to overcome the deficits in the prior art would mean to identify implicitly when a user reacts positive to a search result and when not. A positive reaction to a search result does not necessary mean that a result shown in result list meets completely the needs of a user. Rather it indicates that an item in a result list is relatively better than other results shown.

30 Once an item on the result list comes closer to the subject the user is looking for, the user may be motivated by the referred page or the description to refine the search term(s). The refinement of the search terms has some fundamental drawbacks. The user has to discontinue his reading activities (a cognitive effort) and has to perform a new page load (a time consuming effort). If the new result list is not better than the former the user has to go back to the former. If the new result list is only in part better the user has to toggle between two result lists.

A is therefore an object of the invention to provide a method and a device that allows an intuitive search interaction while providing relevant results.

SUMMARY OF THE INVENTION

The object is achieved by a method and a device according to the independent claims.

5 Advantageous embodiments are defined in the dependent claims.

The mechanism to indicate a positive reaction to a result may either be implemented explicitly: the user marks the item on the research lists (the whole description or a single word in the description shown in the result list) or the mechanism may implicitly
10 measure the user's reaction towards the result list by measuring how long a user holds an item of the research lists in visible state to reading it. An item not read indicates a negative reaction towards an item on the result list.

Once an item is identified to evoke a significant more positive reaction over other results shown on the result list, the list may be altered. In order to not disturb the user
15 while reading or browsing through the list only that part of the list may be altered which was not exposed to the user yet. That may be the part of the list which is accessible by the scroll bar or is shown by pressing the next link exposing the next items of a research list.

20 The information to improve the result list may be obtained by an analysis of the page referred to in the research list to which the user has shown a positive reaction. Such techniques belong to the state of the art and are beyond the scope of this invention. Nevertheless, by obtaining which items on the result list did not evoke any significant
25 reaction, valuable information can be gathered while a user is performing a search to restrain the search list to the most promising candidates. A speedy restriction of the most likely area of interests of the user helps also to reduce the computational efforts for further information retrieval to improve the search list in real time.

30 The invention makes use of the fact that reading items on the search list costs the user more time than just browsing it. The time the user needs to read a certain part of the search list can be utilized to improve the search list not yet visible without disturbing the user by system operations or time-consuming inputs. The technique known as "infinite scrolling" allows updating the search list that is not yet visible, without forcing
35 the user to initiate a new page load. Once the user scrolls to parts of the list not yet visible, he will see items on the search lists which are similar to items he showed already positive reactions towards. Moreover, to detect when the user is reading may also be utilized to continue the information retrieval for good candidates taking only the initial search term into account. Basing the response of the information retrieval system on

implicit feedback by the user and using the above mode of operation carries particular advantages when search results are sent to a mobile device, e.g. a phone, which usually has a small display and explicit data entry is difficult/lacks comfort.

- 5 The invention improves a search system by collecting data of a user while the user is using the system. Nevertheless, the gathered information of the user activity may be further be utilized to evaluate the information retrieval system or to check relevance models which are used to compute the initial result lists.

10 BRIEF DESCRIPTION OF THE FIGURES

Fig. 1 shows a diagram of an exemplary interaction of a server with a user according to an embodiment of a method according to the invention.

- 15 Fig. 2 shows a diagram of different states associated with the interaction shown in Fig.1.

Fig. 3 shows a method according to an embodiment of the invention.

DETAILED DESCRIPTION OF AN EMBODIMENT OF THE INVENTION

- 20 In a typical embodiment, the present invention updates, in an efficient manner, the search result list by reflecting interactions of a user who is reading the list. Furthermore, along with the update of the search results the initial search query of the user is refined to meet the user's interests, which become more manifest due to his interactions.

- 25 As shown in figure 1, a search query 11 is submitted into a client computer's browser 10 by pressing the find button 12 or by pressing the enter key. Via browser the search query is sent to a search engine. Upon receiving the search query, a search engine server identifies documents in a database that are relevant to the search query. Further, the search engine server ranks the relevant documents by, for example, their relevance
30 to the search query among other ranking factors. Descriptions of the top ranked documents together with hyperlinks referring to the documents are then returned to client computer's browser 2.

- Figure 1 illustrates a browser showing initially the hyperlink and description of four
35 top ranked documents (refs. 13,14,15 and 16). Usually just a portion of all research results will be visible at once within the viewport of the browser. To see more than the initially presented part of the search results the user in many search engine applications has to scroll down a page or to click "next page".

Figure 1 shows the case where only one search result becomes visible at one time. The user's dwell time, that is the time that a hyperlink and the corresponding description text of the search result remains visible, is monitored and recorded by the client computer's browser or by a remote computer communicating with the client computer's browser. Different dwell times are assigned to a scale of intensity. By distinguishing different dwell times of search results the user interactions lead to a succession of different dwell time states declared in figure 2.

Figure 1 illustrates the example of dwell times, which are defined either to be long or short determined by a threshold (figure 3, ref. 35). A short dwell indicates that a user is not interested in reading the description of a search result. A long dwell time indicates that it is very likely that a user is reading the description of search result.

Once a dwell time is measured via the browser and proven to be a long dwell time the client's browser sends information of the concerned search result to the search engine figure 3, refs. 36 and 37. As shown in figure 3, ref. 38 the search engine refines the search query by retrieving documents which are relevant regarding the search result with a long dwell time. Figure 1 illustrates the case of search results where the first one "Result A" 17 was just shortly visible while the search result "Result B", ref. 18 shows a longer dwell time. The server engine sends in this case an update to the client computer and the browser show a refinement of the search query "Result B", ref. 21. Further, the search engine transmits an update of the search results which have not yet been disposed to the user 3 to the client computer figure 3, ref. 39.

The search result page is then updated in a way that only the portion of the page which has at this point of time not become visible to the user is modified. A dynamic update of the page while the user is scrolling down the page might be implemented by a technique called infinite scrolling. Infinite scrolling has become the state of the art with some search engines like Microsoft's image search engine image.bing.com or is utilized as a word press plugin by the web site infinite-scroll.com. Infinite scrolling is a technique where content from a subsequent page is pre-fetched and added directly to the user's current page in the moment the user is coming closer to the page's end while scrolling.

Figure 1 illustrates the example that the search results "Result C", ref. 19 and "Result D", ref. 20 are replaced by the more relevant search results "Result B.a1", ref. 22 and "Result B.a2", ref. 23 as a result of the search engine response 4, figure 3, ref. 40. The exact structure of defining a search query that leads to similar or somehow associated and relevant results regarding a given initial result is not in the scope of the present

invention. At this point again, the user either reads the newly added search results that become visible or ignores them. In figure 1 the case is illustrated that the user dwells on the search result "Search Result B.a1", refs. 24, 5.

5 That leads to another update of the automatic refinement (auto-refinement) of the search query and the search results which are next to become visible 6. In FIG. 1 the updated search query is now "Search Result B.a1" 25 and the next search results to become visible are "B.a1.a1" 26 and "B.a1.a2" 27. In figure 1 the example is shown that repeatedly only short dwell times occurred while the user scrolls down the search
10 results 7. If repeatedly only short dwell time occurs this is taken as an indication that a user is not interested in seeing more search results which are similar or associated to the search result which already has shown to have a short dwell time figure 3, 41. In figure 1 an update of the search results is triggered after three search results of short dwell time became visible in succession, refs. 28, 29, 30.

15 The number of search results with a short dwell time might be chosen to be lower or higher. Next, the client computer transmits the signal to the search engine that a succession of search results was visible on client's browser and only short dwell times occurred (figure 3, refs. 41, 42, 43). Further, the search engine sends an update of search
20 results which fits to the next to last auto refinement of the search query 8.

In figure 1 the case is illustrated that the last auto-refinement of the search query is "Search Result B.a1". Now the auto-refinement is updated to the next to last 31, that is "Search Result B" in example illustrated in figure 1. With this auto refinement the
25 search results "Search Result B.a1", "Search Result B.a2" and "Result B.a3" were found to be relevant in the example given in figure 1. Since the search result "Result B.a1" was already presented to a user, it is not presented again. Thus, only the search results "Search Result B.a2" and "Result B.a3" are updated by the search engine 9 as they were not visible yet figure 3, 45. The procedure comes to an end if a user finds a
30 search results with a hyperlink that he chooses to look up. In figure 1 this is case once the search result "Search Result B.a2" 34 becomes visible to the user. The procedure may continue if the user chooses to come back after having visited the page the search result referred to and like to continue to search for better search results.

35 In a further embodiment, the user may be presented with more than one search result at a given time, e.g. a list of search results. In all cases, a method for determining dwell time for an individual search result entry within the list is described in co-pending US patent application 12/495,879 by the same applicant/inventor whose entire contents are incorporated herein by reference.

Claims

1. Computer implemented method for dynamically updating a list of search results, comprising the steps:

- Receiving a first search query by a user;
- Executing the search query;
- Obtaining a list of search results, based on the search query;
- Sending, at least partially, the list of search results to the user;
- Monitoring the user's interactions with the sent results;
- Creating a second search query, based on first search query and the monitored user interactions;
- Updating the list of search results, based on the second search query.

2. Method according to claim 1, further comprising the steps of

- receiving a signal to view further search results;
- sending, at least partially the updated lists of search results to the user.

3. Method according to claim 2, wherein the signal is a scroll signal.

4. Method according to claim 2, wherein the signal is a next or previous results signal.

5. Method according to claim 1, wherein the user interaction with the presentation comprises marking individual search results.

6. Method according to claim 1, wherein monitoring the user interaction comprises determining a time for which a search result was visible to the user.

7. Method according to claim 6, wherein refining the search query comprises determining a relevance score for at least part of the sent search results.

8. Method according to claim 7, wherein the relevance score of a search result is at least partly based on an estimate of the time for which the user has focused on the search result.

9. Method according to claim 7, wherein the estimate of the time for which the user has focused on the search result is also based on scroll movements and/or on the position of the search result in a display of the user.

10. Server for dynamically updating a list of search results, comprising:

- means for receiving a first search query by a user;
- means for executing the search query;

- means for obtaining a list of search results, based on the search query;
- means for sending, at least partially, the list of search results to the user;
- means for monitoring the user's interactions with the sent results;
- means for creating a second search query, based on first search query and the monitored user interactions;
- means for updating the list of search results, based on the second search query.

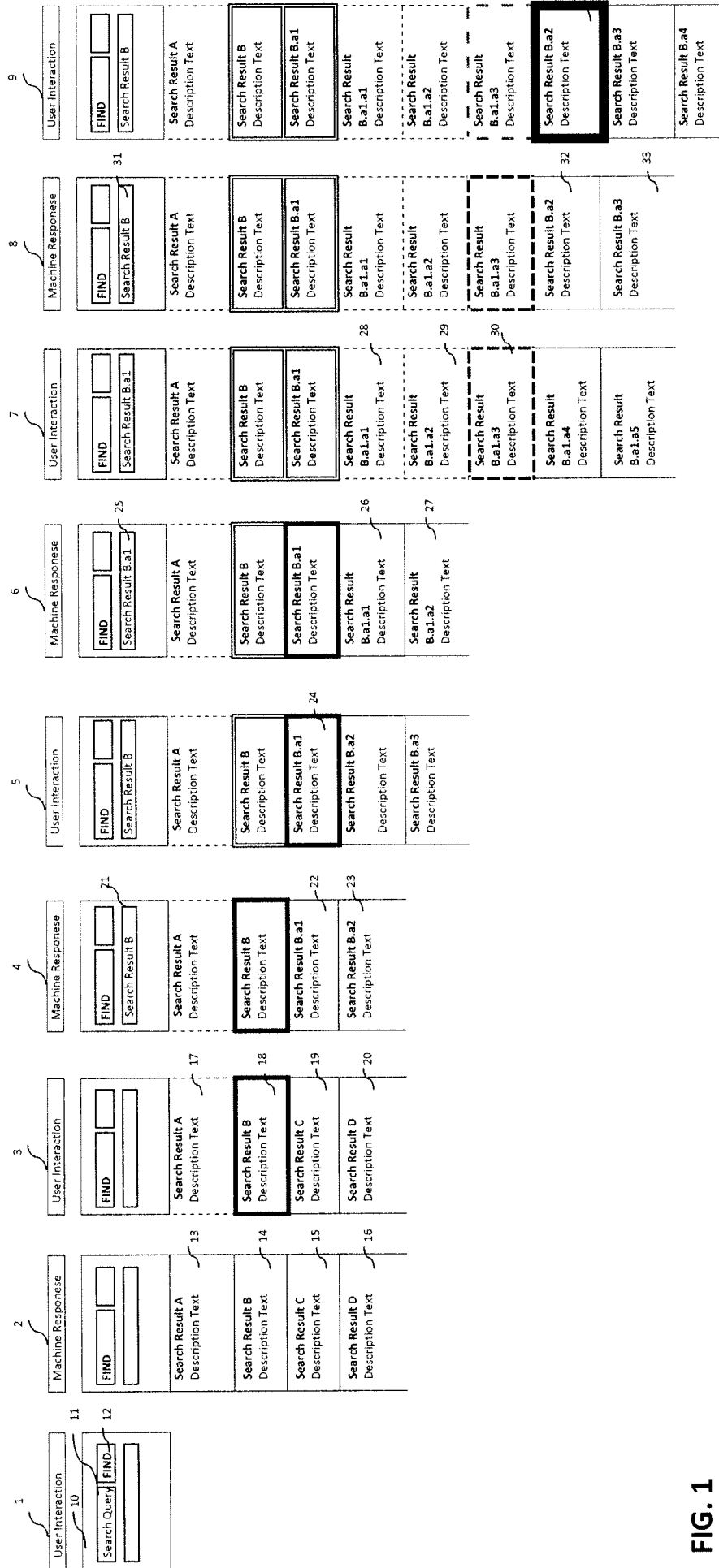


FIG. 1

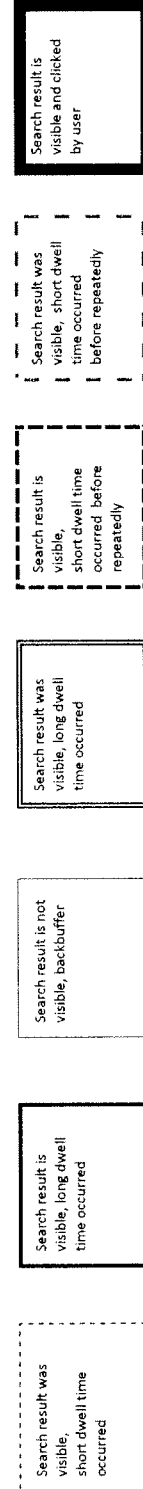


FIG. 2

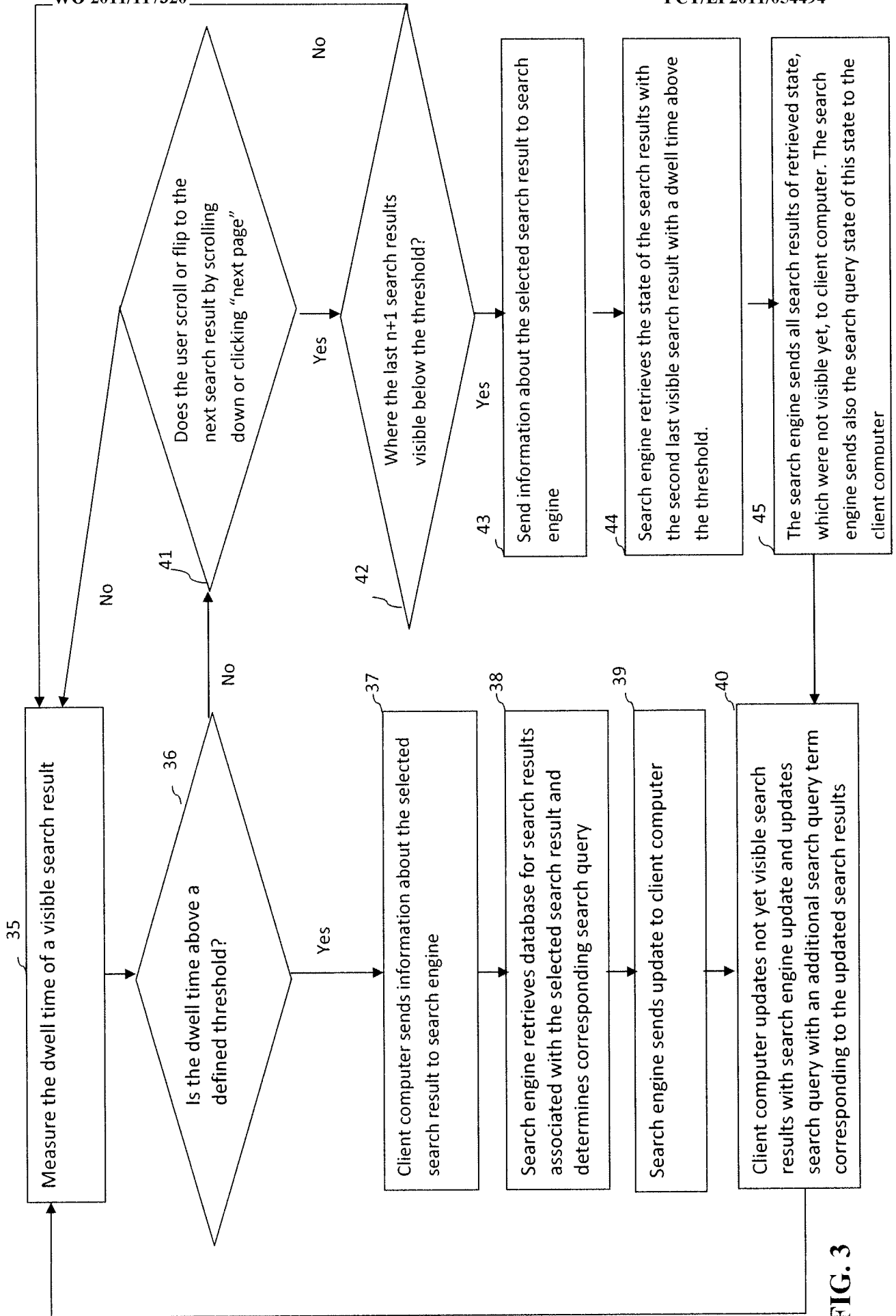


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2011/054494

A. CLASSIFICATION OF SUBJECT MATTER
 INV. G06F17/30
 ADD.

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)
 G06F

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 practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009/240683 A1 (LAZIER ARIEL J [US] ET AL) 24 September 2009 (2009-09-24) paragraphs [0002], [0013] - [0053]; claims 1-5	1-10
X	US 2006/277167 A1 (GROSS WILLIAM [US] ET AL) 7 December 2006 (2006-12-07) paragraphs [0036] - [0136]; figures 13,19	1-5,10
X	US 2009/077037 A1 (WU JUN [US] ET AL) 19 March 2009 (2009-03-19) paragraphs [0005] - [0012], [0020] - [0071]; figures 2-4	1-4,10
X	US 2009/112816 A1 (MARLOW KEITH A [AU]) 30 April 2009 (2009-04-30) paragraphs [0007] - [0013], [0028] - [0050]; figure 2	1-4,10
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Further documents are listed in the continuation of Box C.



See patent family annex.

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

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"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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"&" document member of the same patent family

Date of the actual completion of the international search

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29/06/2011

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/054494

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 671 681 B1 (EMENS MICHAEL L [US] ET AL) 30 December 2003 (2003-12-30) the whole document	1,10

A	US 2006/036565 A1 (BRUECKEN CARL [US]) 16 February 2006 (2006-02-16) the whole document	1,10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/EP2011/054494

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