# USING REPUTATION MEASURES TO IMPROVE SEARCH RELEVANCE

## RELATED APPLICATIONS

This application claims the benefit of United States Patent Application Serial No. 11/948, 788 filed November 30, 2007 ("USING REPUTATION MEASURES TO IMPROVE SEARCH RELEVANCE"), which application is incorporated herein by reference in its entirety.

## TECHNICAL FIELD

The present invention relates to data retrieval. In particular, but not by way of limitation, the present invention discloses techniques for scoring the relevancy of items located in a computer search.

## BACKGROUND

Computers are now used to store massive amounts of information. In order to locate particular information of interest, powerful and intuitive search mechanisms have been created.

For example, the World Wide Web portion of the Internet has grown exponentially since the late 1980's when the World Wide Web was first introduced. Early in the history of the World Wide Web, directories of web sites were used to guide users to web sites of interest. One of the most famous early web site directories was "Jerry's Guide to the World Wide Web" which was later renamed "Yahoo!". However, the rapid real-time growth of the Internet quickly made World Wide Web directories unmanageable and prone to being out of date. Internet search engines such as Lycos, Alta Vista, and Google became the new method finding web sites on the Internet. Internet search engines allow a user to enter a few keywords related to the topic of interest and return with a large set of search results that contain the keywords entered by the user.

Internet search engines operate by "crawling" the World Wide Web to learn about new web pages and then create a searchable index of all the web pages that were visited. When a user enters a set of keywords, the search engine returns a set of web pages that contain the keywords entered by the user. However, most queries entered by search engine users will map to thousands or

even hundreds of thousands of results that contain the matching keywords. This information overload is not desired by the user. Thus, the real key to building a very good search engine is to sort the results by some type of relevancy measure. In this manner, the user of an internet search engine may quickly find desired content.

## BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, which are not necessarily drawn to scale, like numerals describe substantially similar components throughout the several views. Like numerals having different letter suffixes represent different instances of substantially similar components. The drawings illustrate generally, by way of example, but not by way of limitation, various embodiments discussed in the present document.

**Figure 1** illustrates a diagrammatic representation of machine in the example form of a computer system within which a set of instructions, for causing the machine to perform any one or more of the methodologies discussed herein, may be executed.

**Figure 2** illustrates a high level flow chart describing how one embodiment can modify a relevancy adjustment factor in response to user selections.

**Figure 3** illustrates some database tables that may be used in various embodiments of the invention.

**Figure 4** illustrates a high level flow chart describing how the relevancy adjustment factors created in the system of **Figure 2** may be used to adjust relevancy scores for items in a search result set.

**Figure 5** illustrates the relevancy adjustment factor system disclosed in **Figure 2** with an added step to prevent abuse by aggressive users that click on their own items.

**Figure 6** illustrates a relevancy score adjustment system of **Figure 5** wherein a reputation score associated with each user is used to make adjustments that are correlated to the reputation score.

## DETAILED DESCRIPTION

The following detailed description includes references to the accompanying drawings, which form a part of the detailed description. The drawings show illustrations in accordance with example embodiments. These embodiments, which are also referred to herein as "examples," are described in enough detail to enable those skilled in the art to practice the invention. It will be apparent to one skilled in the art that specific details in the example embodiments are not required in order to practice the present invention. Although the example embodiments are mainly disclosed with reference to internet marketplace systems, the teachings can be used with other types of systems that incorporate a search engine. For example, social networking web sites or media presentation web sites may incorporate the teachings of the present invention. The example embodiments may be combined, other embodiments may be utilized, or structural, logical and electrical changes may be made without departing from the scope what is claimed. The following detailed description is, therefore, not to be taken in a limiting sense, and the scope is defined by the appended claims and their equivalents.

In this document, the terms "a" or "an" are used, as is common in patent documents, to include one or more than one. In this document, the term "or" is used to refer to a nonexclusive or, such that "A or B" includes "A but not B," "B but not A," and "A and B," unless otherwise indicated. Furthermore, all publications, patents, and patent documents referred to in this document are incorporated by reference herein in their entirety, as though individually incorporated by reference. In the event of inconsistent usages between this document and those documents so incorporated by reference, the usage in the incorporated reference(s) should be considered supplementary to that of this document; for irreconcilable inconsistencies, the usage in this document controls.

### Computer Systems

**Figure 1** illustrates a diagrammatic representation of a machine in the example form of a computer system **100** within which a set of instructions **124**, for causing the machine to perform any one or more of the methodologies discussed herein, may be executed. In alternative embodiments, the machine

may operate as a standalone device or may be connected (e.g., networked) to other machines. In a networked deployment, the machine may operate in the capacity of a server or a client machine in server-client network environment, or as a peer machine in a peer-to-peer (or distributed) network environment. The machine may be a personal computer (PC), a tablet PC, a set-top box (STB), a Personal Digital Assistant (PDA), a cellular telephone, a web appliance, a network server, a network router, a network switch, a network bridge, or any machine capable of executing a set of instructions (sequential or otherwise) that specify actions to be taken by that machine. Further, while only a single machine is illustrated in **Figure 1**, the term "machine" shall also be taken to include any collection of machines that individually or jointly execute a set (or multiple sets) of instructions to perform any one or more of the methodologies discussed herein.

The example computer system **100** illustrated in **Figure 1** includes a processor **102** (e.g., a central processing unit (CPU), a graphics processing unit (GPU) or both), a main memory **104**, a static memory **106**, which may communicate with each other via a bus **108**. The computer system **100** may further include a video display adapter **110** that drives a video display system **115** such as a Liquid Crystal Display (LCD) or a Cathode Ray Tube (CRT). The example computer system **100** also includes an alphanumeric input device **112** (e.g., a keyboard), a cursor control device **114** (e.g., a mouse or trackball), a disk drive unit **116**, a signal generation device **118** (e.g., a speaker), and a network interface device **120**. Note that various embodiments of a computer system will not always include all of these peripheral devices.

The disk drive unit **116** includes a machine-readable medium **122** on which is stored one or more sets of computer instructions and data structures (e.g., instructions **124** also known as 'software') embodying or utilized by any one or more of the methodologies or functions described herein. The instructions **124** may also reside, completely or at least partially, within the main memory **104** and/or within the processor **102** during execution thereof by the computer system **100**, the main memory **104** and the processor **102** also constituting machine-readable media.

The instructions **124** for operating computer system **100** may be transmitted or received over a network **126** via the network interface device **120**

utilizing any one of a number of well-known transfer protocols such as the File Transfer Protocol (FTP).

While the machine-readable medium **122** is shown in an example embodiment to be a single medium, the term "machine-readable medium" should be taken to include a single medium or multiple media (e.g., a centralized or distributed database, and/or associated caches and servers) that store the one or more sets of instructions. The term "machine-readable medium" shall also be taken to include any medium that is capable of storing, encoding or carrying a set of instructions for execution by the machine and that cause the machine to perform any one or more of the methodologies described herein, or that is capable of storing, encoding or carrying data structures utilized by or associated with such a set of instructions. The term "machine-readable medium" shall accordingly be taken to include, but not be limited to, solid-state memories, optical media, flash memory, magnetic media, and carrier wave signals.

For the purposes of this specification, the term "module" includes an identifiable portion of computer code, computational or executable instructions, data, or computational object to achieve a particular function, operation, processing, or procedure. A module need not be implemented in software; a module may be implemented in software, hardware/circuitry, or a combination of software and hardware.

Search Engines

Search engines are computer programs that are designed to allow a computer user to search a particular domain of information. A search engine typically allows a computer user to enter a set of search keywords and then the search engine generates a set of search results from the search domain that contain the user-specified keywords.

Very popular forms of search engine are the World Wide Web search engines that are available on the global Internet. A World Wide Web search engine allows a web user to enter a set of search keywords and then the World Wide Web search engine returns a search result set World Wide Web pages that contain the user-specified search keywords.

World Wide Web search engines typically operate by having an automated program that learns about new web pages (commonly known as a

"web crawler") visit World Wide Web pages to continually learn about the content that is available on the World Wide Web. The information obtained by the automated web crawler program is used to create a searchable index of all the web pages that were visited by the automated web crawler program. That searchable index is used by the Internet search engine to generate search results for search requests from Internet users.

Determining Relevancy for Search Engines

When a user enters a set of keywords into a search engine, the search engine returns a set of results that contain the keywords entered by the user. For most queries entered by Internet users into an Internet search engine, the keywords entered will often match thousands or even hundreds of thousands of web sites. Search engines that simply return such a massive set of results with hundreds of thousands of web sites simply are not very useful.

A massive information overload is not the result desired by an internet user that simply wishes to locate a good web site with information about the keywords that have been entered into the search engine. Instead, the Internet user would prefer to obtain good search results that are highly relevant to what Internet user is really interested in. Thus, the real key to building a good search engine is to score the search results by some type of relevancy measure and present the results deemed to be most relevant at the top of the search results list. Thus, a goal of relevancy systems is to infer the actual intent of the Internet user requesting an Internet search in order to identify results that best fulfill the intent of the user.

Many Internet search engines have implemented various versions of such relevancy scoring systems in order to improve the quality of the search results provided by those Internet search engines. In one well-known relevancy determination system for World Wide Web sites, each web site is assigned a relevancy score that is dependent upon the number of external hyperlinks that point to that web site. Thus, the more other web sites point to a particular web site, the more relevant that particular web site is deemed to be. In effect, each hyperlink to a web site acts as a popularity "vote" for that web site within the relevancy scoring system. The matching web sites that receive the most such votes will be placed at or near the top of the search results.

One disadvantage of such relevancy systems is that once the system used to calculate the relevancy score becomes widely known, that relevancy system becomes subject to abuse by people wishing to artificially raise the profile of their web sites. For example, if a particular commercial web site wishes to generate a lot of traffic for its web site, then that web site may create many external web sites that link to the main commercial web site. In this manner, the relevancy scoring system of the Internet search engine may be tricked into ranking that commercial site highly despite the fact that the same entity created all those multiple links to the main web site.

Relevancy for Dynamic Data Sets

As set forth in the previous section, one possible method for determining the relevancy of items is a data set is to use some known indicator as to the relative popularity of the items within that data set. Within the context of searching Internet web sites, the relative popularity of a particular web site may be inferred from how many other web sites link to that particular web site. Thus, the number of links to a particular web site may be used as part of a relevancy score within an Internet search engine.

However, in a very dynamic data domain wherein the items in the domain are changing all of the time, such relatively static indications of popularity are not very useful for determining relevancy. For example, in an online marketplace that continually presents new items available for sale, the set of items in the search domain (the items currently available for sale) is continually changing as items are sold and new items are offered for sale. Thus the items available for sale represent a "dynamic data domain". Any links to web pages associated with the items for sale are relatively useless since the items will often be sold before many links are ever made to the web pages associated with items for sale. Thus, other methods are needed to create relevancy scores for a dynamic data domain.

Since the items in a dynamic data domain are continually changing, any information connected directly to a specific item in the dynamic domain (such as a link to a web page for an item currently in the data domain) is not useful for generally determining relevancy since that specific item may soon be gone.

Instead, factors that describe a particular popular item in the data domain (and thus can also be used to describe other similar items) are useful for relevancy.

Furthermore, since the goal is to determine the intent of a user that is searching a dynamic data domain, any measure of relevancy would ideally be correlated to the actual search request made by that user. To meet these goals, a system has been devised that generates relevancy rankings based upon user item selections that are made after a set of search result items has been presented to the user in response to the user's search request.

In the disclosed dynamic data domain relevancy system, the system responds to a user search request with a set of items that fulfil the requirements of the user's search request. The items are normally then displayed in list form with limited additional information. The user may then select any item presented in the search results in order to obtain more information on that selected item. This selection of an item in the search results by the user acts as a popularity vote for that particular item within the context of the user's original search. Note that to be useful for future relevancy determinations; some descriptive factor of the selected item must be abstracted out from the user's selection in order to use that descriptive factor for future relevancy determinations. In this manner, when a relevancy determination must be performed for the same search request but that selected item no longer exists, similar items may be identified in the dynamic data domain with a high relevancy using the descriptive factor that was abstracted out of the selected item.

In one embodiment, the descriptive factors that may be used to identify similar relevant items in the future are additional words in a descriptive field for an item that were not part of the user's original search query keywords. Thus, if a user enters a particular search query and then selects a set of items that all contain a description field with a particular word that was not in the original search query, then having that particular word may raise the relevancy of items for that particular search query. Similarly, if a set of items in the query results all share a particular word but none of those items was selected by the user then having that particular word may lower the relevancy score for items for that search query. Note that other factors may be used and this is just one example of a descriptive factor that may be used to identify similar items in the future.

For example, a user that wishes to purchase a portable digital music player may enter the search query "ipod nano" in a search engine for an online marketplace. In response to the "ipod nano" search query into the online marketplace, the system may present the items with a description field that is listed in the left column. The center column contains the various words from the description field after removing the original search query ("ipod nano") and common stop words (and, or, in, the, for, etc.).

**Table 1: Possible search query results for "ipod nano" search query**

| Reults to Query: "ipod nano" | Extra terms | Item selected:? |
|---|---|---|
| Sealed 4Gb Ipod Nano | Sealed, 4Gb | Yes |
| iPod Nano black | black | No |
| iPod Nano leather skin | Leather, skin | No |
| iPod nano FM transmitter | FM, transmitter | No |
| iPod Nano sealed | sealed | Yes |
| scratched white iPod Nano | Scratched, white | No |
| iPod Nano transmitter for car | Transmitter, car | No |
| New ipod Nano 8GB black | 8GB, black | Yes |
| new 4GB white ipod nano | New, 4GB, white | Yes |
| New leather ipod nano case | New, leather, case | No |

A user that is interested in purchasing a new iPod Nano device may click on the entries for "sealed 4Gb Ipod Nano", "iPod Nano sealed", and "New ipod Nano 8GB black", and "new 4GB white ipod nano". Thus, in future searches for "ipod nano", the items that include the extra terms that were selected by the user should receive an increased relevancy score. One method of performing this is to assign a relevancy adjustment factor to each possible extra word. That relevancy adjustment factor associated with an extra word will adjust the relevancy score for items that have a description with that extra word. When a user selects an item, the relevancy adjustment factors for the extra words associated with that selected item will be increased. Thus, the extra terms associated with the four items selected (sealed, 4Gb, sealed, new, 8GB, black, new, 4GB) should have their relevancy adjustment factors increased. Note that

the extra words may be listed more than once since those terms existed in more than one item selected by the user.

As a corollary, extra words from item descriptions that were not selected may have their relevancy adjustment scores decreased. In one embodiment, such terms must not be in any selected item and must appear in more than one non-selected item. In such an embodiment, the terms "transmitter" and "leather" may have their adjustment relevancy scores decreased.

Determining Relevancy Adjustment Factors

**Figure 2** illustrates a high level flow chart describing how one possible embodiment could operate to modify the relevancy adjustment factors of extra words in the description. The initial relevancy adjustment factor for extra words can be set to a neutral value such as one ("1"). **Figure 3** illustrates some database tables that may be used in various embodiments of the invention.

Referring to the top of **Figure 2**, the system first receives a search query at stage **210**. Next, at stage **220**, the system creates a set of search results fulfil the requirements of the user's search query from stage **210**. Note that this set of search results may be sorted by relevancy as will be described later.

At stage **230**, the system displays a portion of results to the user. In an internet marketplace embodiment, the results may comprise a set of items available for sale. At stage **240**, view another portion of the search results, the user may select items to view in greater detail, or leave this set of results. If the user decides to view another portion of the search results then the system selects another portion of the search results to display and returns to stage **230** to display those results.

If the user decides to view an item from the search results in greater detail, the system proceeds to stage **250**. Since the user selected the item, this item is deemed to be relevant to people who entered the particular search query that was entered back at stage **210**. Thus, the system will increase the relevancy adjustment factor of descriptive factors related to this selected item for this particular search query.

As set forth earlier, one embodiment uses the additional words in a descriptive field for the item that were not part of the search query as a descriptive factor that can be used to identify similar items in the future. Thus,

at stage **250**, the system identifies words from a description field that were not part of search query (if any) and adds these additional descriptive words to a database table **320** associated with a search query entry in a table of popular search queries **310** if these additional words are not already in the additional descriptive words database table **320**.

Next, at stage **255**, the system increases the relevancy adjustment factor for the additional descriptive words that were identified in the previous stage. The relevancy adjustment factor may be kept in the same database table **320** as the additional descriptive words. Not that relevancy adjustment factor for each word is done on per search query basis since relevancy of a descriptive word will vary heavily depending on the item. For example, the word "Persian" may be very relevant for rugs but completely irrelevant for iPods.

After modifying the relevancy adjustment factor of the additional words for the selected item, the system displays the selected item to the user in greater detail at stage **260**. Additional processing will depend on user input at stage **270**. If the user requests to see the next or previous item then the system will obtain the information associated with that item and return to step **250** to handle the appropriate relevancy adjustment factor modifications and display of that item. If the user decides to return to the list view of the search results then the system returns to stage **230** to display the search results in the list view.

If the user decides to leave this particular search query at stage **270** (or leaves this search query at earlier stage **240**) then the system may determine if any relevancy adjustment factor decreases should be made. At stage **280**, the system first determines if at least one item was viewed. If no item was viewed then no relevancy adjustment factor changes may be made since there is insufficient information on whether the user was really interested or disinterested in the displayed items. If at least one item was viewed then the system may proceed to step **290** to possibly reduce one or more relevancy adjustment factors associated with items that were not selected. The system will identify common additional descriptive words that exist in the non selected items. In one embodiment, the system requires that a descriptive word not be in any of the selected items and be in at least two items that were presented to the user but not selected by the user before reducing the relevancy adjustment factor of that descriptive word. Descriptive words that pass this test may have their relevancy

adjustment factors reduced. Note that not all relevancy system embodiments will implement the relevancy adjustment factor reduction system disclosed with reference to stages **680** and **690**.

Using Relevancy Adjustment Factors

**Figure 4** illustrates a high level flow chart describing how one possible embodiment could use the relevancy adjustment factors created in the system of **Figure 2** to adjust relevancy scores for items in a search result set. Note that the system illustrated in **Figure 4** could be used within stage **220** of the system in **Figure 2**.

Initially, a search query is received at step **410**. Then at stage **420**, the system then searches the item database to generate an initial set of results that fulfil the requirements of the search query entered at stage **410**.

After obtaining the initial search result, the search results must be sorted by relevancy. To achieve this goal, the system retrieves the relevancy adjustment factors for the additional descriptive words in the items in the initial result at stage **430**.

Next, at stage **440**, the relevancy adjustment factors are applied to relevancy adjustment scores given to each item in the initial search result. In one embodiment, the relevancy adjustment factor may be multiplied against an initial relevancy score given to an item in a set of search query results to adjust the relevancy score of the item. **Table 2** lists one possible set of relevancy adjustment factors for such an embodiment wherein some extra words associated with an "ipod nano" search query are listed. The relevancy adjustment factors for the extra words may be normalized to stay within a defined range. For example, the set of relevancy adjustment factors have been normalized to stay within the range of zero to two.

**Table 2: "ipod nano" search query relevancy adjustment factor**

| Extra Description Words | Relevancy adjustment factor |
|---|---|
| Sealed | 1.5 |
| black | 0.8 |
| leather | 0.4 |
| transmitter | 0.32 |
| white | 0.74 |
| 4GB | 0.9 |
| case | 0.37 |
| 2GB | 0.6 |
| 8GB | 1.2 |
| new | 1.3 |

To apply the relevancy adjustment factors given in **Table 2** the relevancy adjustment factors are multiplied against an initial relevancy score given to an item if that item has the associated extra word in its description. Thus, referring to **Table 2**, items in a result set for an "ipod nano" search query with highly relevant additional descriptive words such as "sealed", "8GB", and "new" will increase the relevancy score for those items. Similarly, items in a result set for an "ipod nano" search query with largely irrelevant additional descriptive words such as "leather", "transmitter", or "case" will reduce the relevancy score for those items. Many other method of using the relevancy adjustment factor to modify an initial relevancy score may be used.

In an alternate embodiment, the relevancy adjustment factor may be added to an initial relevancy score for an item to adjust the item's relevancy score. **Table 3** lists one possible set of relevancy adjustment factors for such an embodiment wherein some extra words associated with an "ipod nano" search query are listed. The relevancy adjustment factors for the extra words may be normalized to stay within a defined range such as -100 to 100.

**Table 3: "ipod nano" search query relevancy adjustment factor**

| Extra Description Words | Relevancy adjustment factor |
|---|---|
| Sealed | 73 |
| black | -4 |
| leather | -70 |
| transmitter | -83 |
| white | 2 |
| 4GB | -3 |
| case | -80 |
| 2GB | -3 |
| 8GB | 25 |
| new | 82 |

Note that in **Table 3**, the highly desirable terms ("sealed", "8GB", and "new") have large positive relevancy adjustment factors. Similarly, the undesirable terms ("transmitter", "leather", and "case") have large negative scores. The remaining neutral terms will have relatively little effect on the relevancy score.

After adjusting an initial set of relevancy scores, the items are then ordered according to the adjusted relevancy score at stage **450**. The relevancy sorted set of items may then be presented to the user. Since the result set has been sorted with items similar to previously selected items from earlier searches with the same query placed at the top, the user should quickly be able to find a desired item quickly.

Preventing abuse of a Relevancy systems for Dynamic Data Sets

As set forth in the discussion on Internet search engines that rely upon hyperlinks to a web site as a measure of that web site's popularity, such Internet search engines can be abused by people that create thousands of unrelated web sites that link to a specific web site. This multitude of links to a specific web site will create a false appearance of popularity of that specific web site. Similar

methods of abuse may be attempted on the dynamic data set relevancy system disclosed in the previous sections.

For example, very aggressive sellers on an internet marketplace may attempt to create automated programs that repeatedly select the items that such aggressive sellers have posted for sale on the internet marketplace. In this manner, such aggressive sellers may be attempting to make the items that such aggressive sellers post onto the internet marketplace look popular such that those items will receive an increased relevancy score.

To prevent such abuse, a set of various different restraints may be imposed on the relevancy scoring system to stop users from abusing the relevancy scoring system. A first restraint that may be implemented for preventing such abuse may be directed to prevent the exact scenario described in the previous paragraph. **Figure 5** illustrates the relevancy adjustment factor system disclosed in **Figure 2** but with an added step to prevent abuse by aggressive sellers that click on their own items posted for sale.

Referring to **Figure 5**, stage **545** has been added after a user selects an item for viewing in greater detail. At stage **545**, the system determines if the selected item is an item that was posted by this particular user or if this user has already viewed this particular item. If either case is true, then the system skips the relevancy adjustment factor modification stages **550** and **555** and instead goes directly to stage **560** where the system displays the item to the user. In this manner, the system prevents a user from repeatedly selecting his own item. Furthermore, stage **545** prevents a user from creating a second account and then repeatedly selecting his own item from that second account.

Preventing abuse of a Relevancy systems with User Reputation Scores

In internet marketplace systems, it is common to have a reputation score for buyers and sellers that participate in the internet marketplace such that people have some sort of measure as to whether the other party in a potential transaction should be trusted or not. These reputation scores are generally created by having users provide feedback on the other party in a transaction on the internet marketplace after that transaction is completed (or is otherwise ended). In one embodiment of the disclosed system, such a user reputation score has been incorporated into the relevancy system. Incorporating user reputation scores into

a relevancy system improves the results of the relevancy system and reduces the possibility of abuse of the relevancy system.

**Figure 6** illustrates a relevancy score adjustment system for dynamic data sets wherein a reputation score associated with each user has been incorporated into the relevancy system. The system of **Figure 6** is the same as the system of **Figure 5** except that the user's reputation is taken in consideration when making changes to the relevancy adjustment factors. Specifically, stage **655** has been changed to indicate that the system increases the relevancy adjustment factor by an amount correlated to the user's reputation score. Similarly, stage **690** has been changed to indicate that the system reduces the relevancy adjustment factor by an amount correlated to the user's reputation score.

Incorporating user reputation scores into the relevancy system provides a number of significant advantages to the relevancy system. One advantage is that changes made to the relevancy adjustment factors may be made manner that is correlated to the user's skill. An experience user will have a higher reputation score such that selections by that experienced user will change the relevancy system more than a novice user.

Another advantage is that incorporating user reputation scores into the relevancy system can be used to prevent abuse of the relevancy system. Specifically, an aggressive seller may attempt to thwart the restriction set forth in stage **645** that only allows one selection of an item by a particular user to adjust that item by creating a large number of new accounts and selecting the user's item from each of those new accounts. By setting the reputation score of new accounts to be zero or another low value, the selections made by such new accounts will have no or very little effect on the relevancy system. Thus, the creation of a large number of new accounts cannot be used to abuse the relevancy system.

In one embodiment, the users may have different reputation scores for different categories of products available at an internet marketplace. Thus, a person may have a high reputation for buying and selling electronics but only a very novice reputation for buying and selling housewares. In such an embodiment the system would identify the category of product searched and use the user's reputation in that category when making changes to relevancy

adjustment factors. In this manner, the system factors in a person's specific skill set such that their selections in their categories of high reputation will have significant effects on the relevancy system but their selections in other areas will not have significant effects on the relevancy system. Note that this will require a user to participate in a number of successful transactions before that user's selections have a significant effect on the relevancy. This helps prevent a person from attempting to create many accounts that participate in one transaction each and then using those many accounts to abuse the relevancy system.

Integration with other Relevancy Systems

The relevancy system for dynamic data sets that has been disclosed may be integrated with other relevancy systems that are based on other factors. For example, an alternate system may use the reputation of sellers when determining relevancy such that sellers with higher reputations receive higher relevancy scores than sellers with low reputations. In such a system, buyers will be presented with more reliable sellers at the top of the search results. The presented relevancy system for dynamic data sets could be combined with such a system (or multiple other relevancy systems) such that a combined relevance score is used to present search results.

Although the relevancy system has largely been disclosed with reference to an internet marketplace embodiment, it must be stressed that the relevancy system can be used in many other embodiments. In other embodiments, the user reputation score may be replace with another similar measure of a user's experience with a system. For example, in an embodiment for a message posting board the user reputation score may be replaced with a number of postings made by that user. Furthermore, the invention has been described with a descriptive factor of other words in description field item but any other descriptive factor than can be used to identify similar items in the future can be used.

The preceding description is intended to be illustrative, and not restrictive. For example, the above-described embodiments (or one or more aspects thereof) may be used in combination with each other. Other embodiments will be apparent to those of skill in the art upon reviewing the above description. The scope of the claims should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to

which such claims are entitled. In the appended claims, the terms "including" and "in which" are used as the plain-English equivalents of the respective terms "comprising" and "wherein." Also, in the following claims, the terms "including" and "comprising" are open-ended, that is, a system, device, article, or process that includes elements in addition to those listed after such a term in a claim are still deemed to fall within the scope of that claim. Moreover, in the following claims, the terms "first," "second," and "third," etc. are used merely as labels, and are not intended to impose numerical requirements on their objects.

The Abstract is provided to comply with 37 C.F.R. §1.72(b), which requires that it allow the reader to quickly ascertain the nature of the technical disclosure. It is submitted with the understanding that it will not be used to interpret or limit the scope or meaning of the claims. Also, in the above Detailed Description, various features may be grouped together to streamline the disclosure. This should not be interpreted as intending that an unclaimed disclosed feature is essential to any claim. Rather, inventive subject matter may lie in less than all features of a particular disclosed embodiment. Thus, the following claims are hereby incorporated into the Detailed Description, with each claim standing on its own as a separate embodiment.

**CLAIMS**

What is claimed is

1. A method of inferring relevancy from search query results, said method comprising:

accepting a search query from a user of a search engine;

generating a set of search result items in response to said search query;

accepting a selection by said user of a first item from said set of search result items; and

modifying a relevancy adjustment factor for a first descriptive factor by an amount correlated to a reputation score of said user, said descriptive factor being abstracted out from said first item such that said descriptive factor identifies said first item and a second item;

accepting an additional search query from one of said user and an additional user of said search engine, said additional search query being identical to said search query; and

generating an additional set of search result items in response to said additional query, said generating including ranking said second item based on said relevancy adjustment factor for said descriptive factor.

2. The method of inferring relevancy from search query results as set forth in claim 1 wherein said reputation score of said user is based on a rating given by a party that entered into a transaction with said user.

3. The method of inferring relevancy from search query results as set forth in claim 1 wherein said descriptive factor comprises a word from a description field of said second item.

4. The method of inferring relevancy from search query results as set forth in claim 1 wherein said modifying of said relevancy adjustment factor for said descriptive factor was not performed when said user posted said first item.

5. The method of inferring relevancy from search query results as set forth in claim 1 wherein said relevancy adjustment factor for said descriptive factor is only valid for said search query.

6. The method of inferring relevancy from search query results as set forth in claim 1 said method further comprising:

detecting that said user did not select a third item, said third item included in said set of search result items;

abstracting out an additional descriptive factor from said third item, said additional descriptive factor identifying said third item and a fourth item;

modifying a relevancy adjustment factor for said additional descriptive factor by said amount correlated to said reputation score of said user;

wherein said additional set of search result items ranks said fourth item based on said relevancy adjustment factor for said additional descriptive factor.

7. The method of inferring relevancy from search query results as set forth in claim 1 wherein said search result items comprise items for sale in an online marketplace.

8. A non-transitory computer-readable medium, said non-transitory computer readable medium comprising a set of instructions, said set of instructions implementing a method for inferring relevancy from search query results, said method comprising :

accepting a search query from a user of a search engine;

generating a set of search result items in response to said search query;

accepting a selection by said user of a first item from said set of search result items; and

modifying a relevancy adjustment factor for a descriptive factor by an amount correlated to a reputation score of said user, said first descriptive factor being abstracted out from said first item such that said descriptive factor identifies said first item and a second item;

accepting an additional search query from one of said user and an additional user of said search engine, said additional search query being identical to said search query; and

generating an additional set of search result items in response to said additional query, said generating including ranking said second item based on said relevancy adjustment factor for said descriptive factor.

9. The non-transitory computer-readable medium as set forth in claim 8 wherein said reputation score of said user is based on a rating given by a party that entered into a transaction with said user.

10. The non-transitory computer-readable medium as set forth in claim 8 wherein said descriptive factor comprises a word from a description field of said second item.

11. The computer-readable medium as set forth in claim 8 wherein said relevancy adjustment factor is only valid for said search query.

12. The non-transitory computer-readable medium as set forth in claim 8, the method further comprising:

detecting that said user did not select a third item, said third item included in said set of search result items;

abstracting out an additional descriptive factor from said third item, said additional descriptive factor identifying said third item and a fourth item; and

modifying a relevancy adjustment factor for said second descriptive factor by said amount correlated to said reputation score of said user,

wherein said additional set of search result items ranks said fourth item based on said relevancy adjustment factor for said additional descriptive factor.

13. The non-transitory computer-readable medium as set forth in claim 8 wherein said search result items comprise items for sale in an online marketplace.

14. The method of claim 1, wherein the including of said second item in said set of search result items is based on a determination that said first item no longer exists in a dynamic data domain.

15. The method of claim 1, wherein said search query includes a keyword and said descriptive factor does not include said keyword.