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Manipulating search engine algorithms: the case of Google

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Abstract

Purpose – To investigate how search engine users manipulate the rankings of search results. Search engines employ different ranking methods in order to display the "best" results first. One of the ranking methods is PageRank, where the number of links pointing to the page influences its rank. The "anchor text," the clickable text of the hypertext link is another "ingredient" in the ranking method. There are a number of cases where the public challenged the Google's ranking, by creating a so-called "Google bomb" – creating links to pages they wanted to be highly ranked for given query. Google is chosen as the search engine, because it is currently by far the most popular search engine.

Design/methodology/approach – PageRank, one of the major parameters of Google's ranking algorithm is described, and the author explains how this algorithm is exploited by communities of users to promote a certain web page for a specific query. This process is called "Google bombing." Recent reaction of Google to this phenomenon is also described.

Findings – Specific examples of "accomplished Google bombs" show that the public is able to manipulate search results.

Originality/value – Google, instead of being an unobtrusive information retrieval tool has become highly influential in the web scenery. Some users pay for search engine optimization, while others utilize the power of the crowd to influence Google's rankings. This paper supports the claims of Introna and Nissenbaum regarding the power of search engines.

Keywords Information searches, Search engines, Internet

Paper type Research paper

Introduction

The web has existed only for about 17 years, but it has already become one of the major information sources both in our professional and in our everyday lives. The number of web pages and sites on the web is growing constantly. One of the more recent studies estimates the size of the web as of 2005 to be 11.5 billion web pages (Gulli and Signorini, 2005). This estimate is already outdated, and in any case it only measures what Lawrence and Giles (1998) called the "indexable Web," which excludes the so-called "deep Web," mainly data retrieved from databases and presented to the web user in dynamic, momentarily existing web pages. The deep web was estimated to be at least 450 times larger than the indexable web (Berman, 2001).

The major tools for locating information on the web are the search engines. The most popular search engine by far (at least in the USA) is Google, with a share of 56.3 percent (or an estimated 4 billion queries in May 2007) (Nielsen/Netratings, 2007). In the UK, for example, based on data from August 2006, Google's share is even higher: 68.0 percent (Nielsen/Netratings, 2006). Because Google is the most popular search engine by far, and has been most frequently targeted by users trying to influence its search results rankings, this paper concentrates on the public's attempt to manipulate Google's search results.

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Since, for most queries, search engines retrieve thousands of results, there is a need to rank the results and to display the search results in a ranked order. Each search engine has its secret ranking algorithm, and these algorithms change over time. Some known ingredients of Google's ranking algorithm will be described below.

Web page owners for commercial and vanity reasons want their pages to rank high for queries that are relevant for their company or for their web pages. Several studies have shown that users usually view only the first result page, which typically displays only ten results (Spink and Jansen, 2004). Moreover, it has been shown through an eye-tracking study (Enquiro, 2005) that users clearly concentrate only on the top-three results displayed by the search engine.

There are several ways to increase the ranking of a page for a given query. Some search engines allow paying for placement; these results are currently clearly delineated in most search engines in a special area allocated for "sponsored results." Google and Yahoo developed complex algorithms that allow users to bid for placement in the set of sponsored results. Yahoo also has a paid-inclusion program, where the search engine does not commit to place the submitted pages in high positions for queries; it only includes the submitted pages in its huge database. There is currently no paid-inclusion program for Google.

If the issue is important enough for the site owners and they can afford it, they can employ a search engine optimizing company, whose aim is to improve the site's ranking for given queries at given search engines – see, for example (SEMPO, 2006) and (Sherman, 2007).

Thus, it seems that instead of trying to please the users, site owners invest great efforts and money in pleasing the search engines that serve as mediators between the site owners and the public. Search engines, and especially Google, have become extremely powerful. They decide who is to be visible and who is to be practically invisible on the Web. Issues related to the politics of search engines have been extensively discussed, for example, by Introna and Nissenbaum (2000) and by Hargittai (2004).

It turns out that even without financial resources; the public may have some influence on the search results. The process, called Google bombing involves a group of people who decide to promote a certain web page for a given query. The term Google bombing is even included in the second edition of *The New Oxford American Dictionary* (Price, 2005). There, Google bombing is defined as "the activity of designing Internet links that will bias search engine results so as to create an inaccurate impression of the search target" (Price, 2005). In this paper, we interchangeably use the term "People's rank" for "Google bombing," because we view this process as a Web 2.0 activity, where a community is trying to have its voice heard by changing the ranking of the powerful search engine, Google.

Before providing a typology of Google bombs, examples of successful ones and discussing how Google decided to fight back, first we describe the relevant "ingredients" in Google's ranking algorithm: the PageRank and the anchor text. The name PageRank is a trademark of Google. The PageRank process has been patented (US Patent 6,285,999). The patent is not assigned to Google but to Stanford University.

Google's ranking algorithm

Information retrieval (IR) systems that existed before the web employed ranking algorithms that were based on term frequency and on inverse document frequency

(Baeza-Yates and Ribeiro-Neto, 1999). Additional parameters used were the proximity of the search terms in the text (the nearer terms are to each other, the document is assumed to be more relevant to the search) and the placement of the terms in the text. The web offers additional parameters that can be taken into account. Some of these are related to web page design, e.g. font size and type used for displaying the search term in the document), while others appear in the web page's meta tags (these can be Dublin Core meta tags (Dublin Core Metadata Initiative, 2007) or the meta tags, keywords and description that are part of the basic html tag set (Sullivan, 2007).

The most interesting parameters are those that are related to the hypertext structure of the web: the links and the anchor text (the clickable text of the hyperlink). The concept of ranking pages according to the number of links pointing to it was introduced by Carriere and Kazman (1998). They proposed to rank the search results according to the number of links pointing to the web pages. Straight counts like that are employed in citation networks (Garfield, 1979) and in sociograms for discovering sociometric stars (Moreno, 1948). Simple counts seem to work when considering citations in scholarly communication, probably because of the peer review system. However, in the web, anyone can create dummy web pages and link from them to the page to be promoted. In addition, on the web, hypertext links do not only serve as a "vote of confidence," but are also used for navigation. Depending on the structure of the web site, there can be huge quantities of web links within the web site (called self-links). Thus, in order to take advantage of the structure of the web a more complex counting method had to be used. Such a method, called PageRank was introduced in 1998 by the founders of Google, and Brin and Page (1998). The basic idea is to give higher weight to links coming from high-quality sites, where a site is a high-quality site, if it has a large number of incoming links. It is worth noting, that similar ideas also appeared in social (Katz, 1953) and citation networks (Pinski and Narin, 1976). A very clear explanation of the PageRank can be found in (Levene, 2006, pp. 93-7).

Google (2007a) provides the following explanation regarding PageRank:

> PageRank relies on the uniquely democratic nature of the web by using its vast link structure as an indicator of an individual page's value. In essence, Google interprets a link from page A to page B as a vote, by page A, for page B. But, Google looks at considerably more than the sheer volume of votes, or links a page receives; for example, it also analyzes the page that casts the vote. Votes cast by pages that are themselves "important" weigh more heavily and help to make other pages "important." Using these and other factors, Google provides its views on pages' relative importance.

Google's ranking algorithm takes into account additional parameters as well; one of the more relevant ones in the context of this paper is the "anchor text," which is the clickable part of hypertext link. The rationale for weighing in the anchor text is that it often provides a compact description of the page it links to, or describes the page in another language. We demonstrate this here by submitting the query Motzart (clearly a misspelling) to Google on July 5, 2007. The seventh result on the page is about visiting Salzburg (www.visit-salzburg.net/mozart.htm) – see Figure 1. When checking the cached version of this page at Google (by clicking the "Cached" link at the end of the snippet describing the page), Google reports that the term only appears in links pointing to this page, as can be seen in Figure 2.

Google bombs rely both on links and anchor texts. The group of people who wants to promote a webpage for a certain query, add a link to that page, where the anchor text

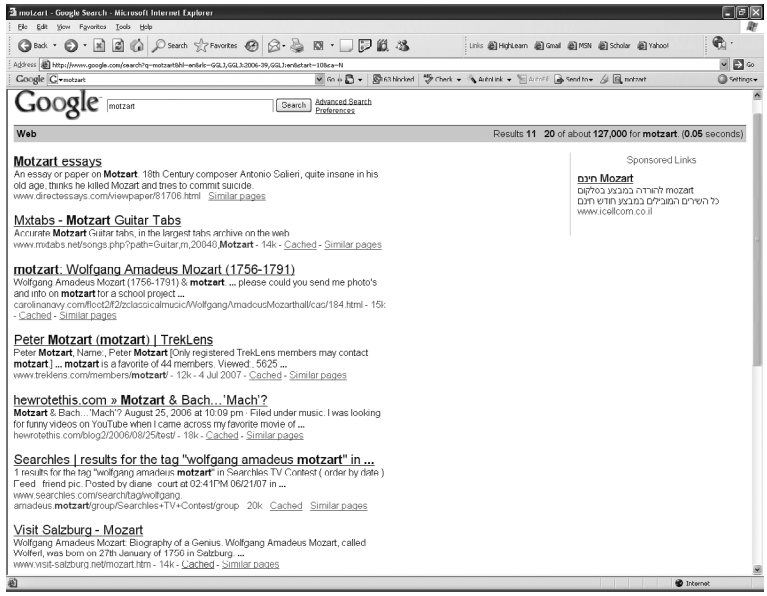

Figure 1.
Searching for Motzart on Google

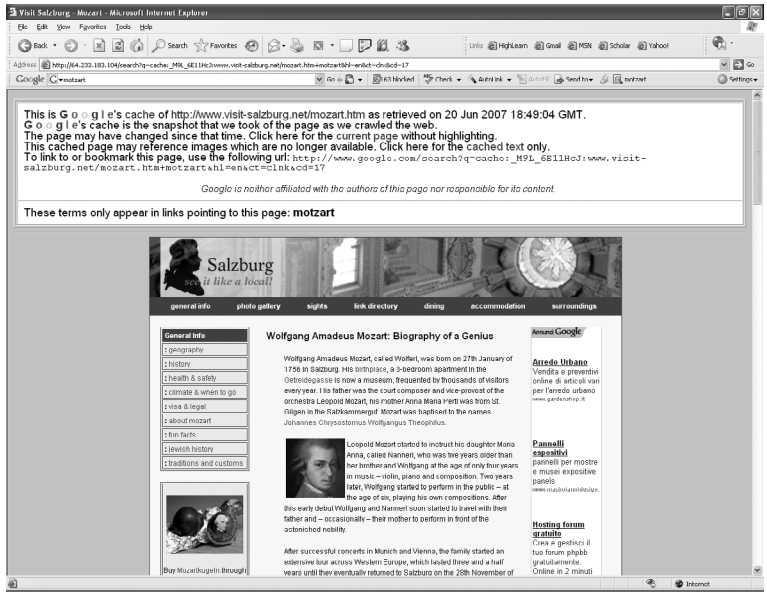

Figure 2.
Terms that appear in the anchor text only

is the query. One of the most famous Google bombs used to be "miserable failure," for which query the top-ranking page used to be the official biography of President Bush (the page of course, did not contain the phrase "miserable failure"). Thus, the essence of a Google bomb is to create lots of links with a given anchor text. This strategy, when enough users were ready to cooperate, used to work until recently, when Google decided to fight back and to get rid of these Google bombs, as will be discussed in the section on Google's reaction. The links to the Google bombed page most often emanate from blogs or forums, where it is very easy to add and remove links from the sidebars of the blogs and or discussion pages. One of the characteristics of blogs is that the sidebar, which often contains a large number of links to other blogs (called the "blogroll") and to other sites or pages of interest to the blogger, appears on each and every blog post that is archived by the blogging software. Thus, by a simple edit of the blog template, the blogger can add (or remove) hundreds of links to a webpage. This is the favored method utilized for Google bombing.

A typology of Google bombs

Hiler (2002) proposed a typology of Google bombs, based on the reasons for their creation, he defined four types – humor, ego, money and justice. Here, we extend his typology and use a slightly different terminology.

- Fun – one of the first Google bombs, created in 2001, was to bring up Andy Pressman's homepage as the first result for the query talentless hack. The bomb was designed by his friend who recruited fellow bloggers for the task. This Google bomb has been "defused," i.e. when searching for talentless hack, Andy Pressman's homepage does not appear among the top results.
- Personal promotion – Google has become a central place for looking up people. Even the Oxford English Dictionary (2006) includes the verb Google: "[t]o search for information about (a person or thing) using the Google search engine." Thus, it is quite understandable why people would want to see their homepage as the first result when searching for their name. A famous example is the photographer-reporter David Gallagher, who asked for the community's help so that his homepage will be ranked before the movie star David Gallagher's page. "Our" David Gallagher's homepage (www.lightningfield.com) is still no. 3 for this search as of July 2007, but it has been shown (Bar-Ilan, 2007) that the reason for this is placement is genuine and not the result of a Google bomb.
- Commercial – Hiler (2002) does not provide any specific examples of this type of a Google bomb, but states that buying a Google bomb is probably cheaper then buying a sponsored placement on Google, and web site owners prefer to show up high on the organic results than on the sponsored ones. A more concrete example is a marketing company Quixtar that has been accused of setting up fake blogs with success stories – see (Quixtar Blog, 2004) and (Luymes, 2007) representing opposing views on the issue. In July 2007, the Quixtar homepage is the top result for the query Quixtar.
- Justice – these are bombs are against evil corporations or sites. One example was a Google bomb that was created in 2002 against a company called Critical IP: the anchor text Critical IP linked to a blog posting (a.wholelottanothing.org/2002/02/note_to_domain.html) explaining how the company obtains phone numbers

from an internet database and uses these numbers for telemarketing. At least for a while the blog posting was the number one result, when searching for Critical IP. Even as of July 2007, this is the seventh result for this search, where all the results above it also deal with this Google bomb. The company's homepage is not among the top 100 results, even though there is a site at criticalip.com, however, it is not certain that this is the same company that has been targeted. A different kind of justice Google bomb was created in protest of people who were looking for the videotape of Daniel Pearl's execution. In this case too, an alternative webpage was promoted for the query Daniel Pearl videotape. The page expressed disgust with people who wanted to view the tape. This Google bomb was created in 2002, and the alternative webpage, home.nyc.rr.com/janegalt/Videotapes.htm, still comes up as the second result for this query as of July 2007.

- Ideological – a good example of this type of Google bombing is the query Arabian Gulf. The promoted site for this query, http://arabian-gulf.info/ looks like a page not found (404 error page) that explains that the "Gulf you are looking for does not exits. Try Persian Gulf." The reason for this page is a controversy about the name of the Persian Gulf that started when the National Geographic Society had considered Arabic Gulf as the second name for Persian Gulf in its 8th edition of its World Atlas (Green Years, 2004). This is a long-term naming dispute (Persian Gulf naming dispute, 2007), that also reached the internet, and this Google bomb is still successful as of July 2007.
- Political – The best known example in this category is the query miserable failure, for which the top result used to be the official biography of George W. Bush. This Google bomb could be characterized as "fun" as well. In order to be a real political bomb, the bombers should have created an alternative George W. Bush biography page, expressing their opinion about him and should have tried to promote this page instead of the official George W. Bush biography. This probably was not achievable, thus they had to be content with this practical joke. This Google bomb was successful from 2003 until the beginning of 2007, when Google changed its ranking method in order to overcome such Google bombing attempts – see discussion below and (BBC, 2003; Cohen, 2007).

In most cases, like in all of the abovementioned examples, there was only a single targeted page, but there are a few examples where there are two competing pages, each page bombed by a different, rivaling group. The two best-known examples are the Google bombs for the queries scientology and jew.

The scientology homepage (www.scientology.org) is being promoted by a huge number of sites created by the Church of Scientology and affiliates. Some claim that some of these sites exist only to promote the homepage of the Church of Scientology. The second group, of course, is the opponents of the Church of Scientology, who promote the homepage of the site xenu.net instead for the query scientology. Seemingly, the Church of Scientology was and is disturbed by this site, because it tried to close it down and to exclude it from the Google database (it even succeeded temporarily – see (Operatingthetan, 2002) and (Gallagher, 2002)). This dispute about the placement emphasizes the power of Google, supporting the views of Introna and Nissenbaum (2000). As of July 2007, the Church of Scientology page is the top result when searching for scientology on Google, while xenu.net is ranked third.

Google bombing of the query jew also involved two different pages. The Google bombing started out in March 2004, when *the Jewish News Weekly of Northern California* published an article about the results of the search for the query jew on Google (Ashkenazi, 2004). The web community (Jews and non-Jews) who did not like that the top result for the query "jew" on Google was a highly anti-semitic site (Jewwatch, www.jewwatch.com), took several steps:

(1) a petition was circulated and signed by a large number of people to remove the "Jewwatch site" (Removejewwatch, 2004); and

(2) web users were encouraged to link to the Wikipedia entry "jew" (http://en.wikipedia.org/wiki/Jew).

In parallel, Google refused to change the ranking algorithm or to remove the site manually, but published a page that appeared (and still appears as of July 2007) in the sponsored link spot when searching for jew, trying to explain why they "are disturbed by the results as well" (Google, 2007b). The issue also reached the newspapers, see, for example, the report in the *New York Times* (Flynn, 2004). Interesting to note, that even though Google refused to remove the Jewwatch site or to lower its rank, the site was not (and is not) indexed by google.de (Google Germany) and google.fr (Google France), due to local laws against distributing anti-semitic materials – see (Zittrain and Edelman, 2002) and the link to Chilling Effects (2007) when searching for jew on google.de and google.fr. A detailed analysis of the links to the two competing pages appears in Bar-Ilan (2006). As of July 2007, the Wikipedia entry is placed first and the jewwatch homepage is ranked third when searching for jew on google.com.

Additional examples of Google bombs

In this section, we mention a few more Google bombs. This is far from being a comprehensive list. All the queries in this section are in English, while there are Google bombs in other languages as well.

One of the earliest Google bombs (it is not even clear that it was a Google bomb) back in 1999, was for the query more evil than Satan for which the top ranking page was Microsoft's homepage (Sullivan, 1999). Another example is the query French military victories, where the targeted page was www.albinoblacksheep.com/text/victories.html. This page looks like a Google search results page that says that there are no results, and suggests the alternative query French military defeats. When entering the query weapons of mass destruction in 2003, the top result used to be www.coxar.pwp.blueyonder.co.uk/, which looks like an html 404 page (Page not found) that said: "Cannot find weapons of mass destruction." Not only the official biography of George W, Bush was Google bombed, but also the official biography of the former British Prime Minister Tony Blair (a page that used to reside at www.number-10.gov.uk/output/Page4.asp) was also targeted for the queries poodle and liar. Even though Google has taken steps to lessen the effect of Google bombs, the Wikipedia entry on "Google bomb" (Google bomb, 2007) reports that when searching on Google New Zealand (google.co.nz) for clueless, the top result since June 2007 is the homepage of John Key, the New Zealand National Party leader (johnkey.co.nz).

Google's reaction to Google bombing

When Microsoft's homepage came up first for the search more evil than Satan, Google's reaction was that the listing is an "anomaly caused by quantum fluctuations in Web space" (Spring, 1999).

The next round of comments by Google appeared in 2001 (Sullivan, 2001). This time they explained that although weighing in anchor text can sometimes be misleading, but overall analyzing links helps Google return better results. In 2002, Sullivan (2002) published an article about Google bombs, he states that:

> Google combats these attempts by identifying what it considers to be "artificial" link structures and adjusting or eliminating their influence in the rankings. Google has also recently taken action against reciprocal link pages, link "farms" and guest books, downplaying their importance in its link analysis algorithms. And there's no doubt that Google will take action against weblogs, if those weblogs are seen as manipulating results in a way that doesn't correspond with user expectations.

Google's Matt Cutts, who now heads the Google Webspam team, commented at about the same time (Reuters, 2002) that he does not believe that Google bombing could effect a popular term.

In 2003, the *New York Times* (Hansell, 2003) reported as a reaction to the miserable failure Google bomb, that "We [Google] just reflect the opinion on the Web, for better or worse."

As mentioned before, Google took the controversy about the query jew more seriously. At first a Google spokesman commented at the *New York Times* (Flynn, 2004): "We find this result offensive, but the objectivity of our ranking function prevents us from making any changes." In their explanation when on the search results page for jew they add: "[s]ometimes subtleties of language cause anomalies to appear that cannot be predicted" (Google, 2007b).

In 2005, the issue emerged again, this time because of the miserable failure query. This time the comment was published on the Official Google Blog (Mayer, 2005). The blog posting explained that:

> Google's search results are generated by computer programs that rank web pages in large part by examining the number and relative popularity of the sites that link to them. By using a practice called googlebombing, however, determined pranksters can occasionally produce odd results ... We don't condone the practice of googlebombing, or any other action that seeks to affect the integrity of our search results, but we're also reluctant to alter our results by hand in order to prevent such items from showing up.

The posting was added as the top sponsored result when searching for miserable failure with the title and snippet "Why these results? These results may seem politically slanted" (Searchenginewatchblog, 2005). Note that this posting is considerably different from the 2003 comment (Hansell, 2003) calling Google bombing as "Web opinion."

The final chapter in this "saga" took place at the beginning of 2007 (Moulton and Carattini, 2007), when Google announced that it has taken steps for "minimizing the impact of many Googlebombs." They chose "an automatic way to solve the problem instead of trying to fix a particular search by hand." This algorithmic change introduced by Google was successful in "defusing" several Google bombs, including miserable failure, liar and poodle. Still there are a few newly reported

Google bombs – see (Google bomb, 2007) on Wikipedia, and some of the older ones are still active, as reported in this paper.

Conclusions

We have seen that even with the new ranking algorithm of Google, a number of Google bombs remain active, showing that PageRank has not yet totally won over People's Rank. Although in most cases these Google bombs do not have any serious implications, they show that the search engine users as a community can influence search engine rankings.

Currently, Google has a huge influence on the web scenery. It has become much more than an IR tool. Users try to "please" Google, so that their web pages become top ranked results for appropriate search terms. They optimize their web pages in order to improve the rankings of the pages on Google. When simple optimization is not possible, e.g. when they want to promote a page that they are not authorized to change, they are still not powerless – they can try to create a Google bomb for that query. Google bombs only work when the community agrees to help out. Google bombing is clearly a Web 2.0 activity, even though it started before the term "Web 2.0" was invented.

We conclude with an interesting observation. Google is engaged in self-Google bombing. Google's motto is "do no evil" or "don't be evil" (Google, 2007c). When searching for evil on Google, the 16th result is Google's own page, www.google.com/corporate/tenthings.html. If this page becomes more popular, the Google page might easily end up as number one for the query evil.

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