

Which search engine is best at finding airline site home pages?

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Abstract

We evaluate the effectiveness of 20 Web search engines on 95 site finding queries. Each query names an airline, with the correct answer being the airline's official home page URL (as listed by the International Air Transport Association). Performance varies widely across the 20 engines, indicating that site finding problem is not consistently well solved in practice. Users may wish to take this into account when deciding which engine to query.

1 Introduction

The site finding problem is, given the name of a site, to find its home page URL. For experienced Web users, effective site finding is most important in cases where the required URL is difficult to guess. For users less accustomed to URLs, the ability to enter a name rather than a URL is of even greater importance.

This technical report applies a new site finding evaluation methodology on the live Web, and in the domain of airline companies. The methodology was first developed by Craswell, Hawking and Robertson [1].

2 Method

1. Identify a set of Web site home pages. We used the IATA listing of its member airlines, choosing 95 sites. This use of an authoritative, human-generated list avoided introducing biases which might have come from browsing or searching for candidate sites. For example, a browsing process would tend to find sites with many incoming hyper-links, biasing the experiment in favor of link-based engines like Google (<http://www.google.com/>).
2. For each site, generate a query. We used the name of the site, as listed by IATA. So the query for <http://www.qantas.com.au> was "Qantas". (We manually eliminated words such as "ltd" and "sa" from the query, and in some cases deleted alternate names.)
3. Apply the queries at the engines being evaluated (Appendix B lists our 20 engines).

Rank	Fast	Goog	Micr	Hotb	Nbci	Meta	Lyco	Yaho	Nets	Dire
1	74	74	55	62	18	55	51	66	4	51
2	8	8	13	8	6	8	4	4	22	5
3	3	2	5	2	26	3	4	0	28	1
4	1	1	3	0	10	3	3	0	9	2
5	0	1	3	2	5	1	6	0	0	2
6	2	1	1	0	1	1	3	0	3	0
7	0	0	1	0	2	1	1	0	0	0
8	1	0	0	0	0	1	0	0	0	0
9	0	0	0	0	1	1	0	0	1	0
10	0	0	0	1	1	0	0	0	1	1
no	6	8	13	20	21	21	22	25	27	33

Rank	Webc	Look	Exci	Goto	Dmoz	Webt	Alta	Ragi	Nort	Offi
1	40	34	40	23	29	0	33	32	7	8
2	6	11	6	9	7	2	2	3	3	1
3	2	3	2	6	1	0	1	0	3	0
4	1	1	1	7	2	2	2	2	1	0
5	1	1	1	1	2	0	0	0	2	0
6	0	1	0	2	0	2	0	0	0	0
7	0	1	0	0	2	10	0	0	2	0
8	0	0	0	1	0	4	0	0	0	0
9	1	0	1	1	1	4	0	0	0	0
10	1	0	1	0	0	3	1	1	0	0
no	42	43	43	45	50	54	56	57	77	86

Table 1: Results: Rank distribution of first correct answer, over the 95 queries. For example, Fast returned the correct page at rank one in 74 out of 95 cases, and in the top ten in all but 6 of the 95. Each column heading is the first four letters of an engine name appearing in Appendix B.

4. For each query, pool the engines' results. Examine the URLs returned in order to find any mirror, alias or forwarding URLs. For example, <http://www.qantas.com> was an alias for <http://www.qantas.com.au>, so either URL was a correct answer. See Appendix A for a complete list of queries and correct answers.
5. Measure the effectiveness of the engines.

We used a simple Perl script to run the 95 queries at each engine, then extract links from results pages, eliminating links to partners and advertisers and following redirections where necessary. We only considered the top 10 results listed by each engine.

The pooled judging uncovered a number of URL equivalences (leading to the multiple correct answers listed in Appendix A).

We used two effectiveness measures. One is the reciprocal rank of the first correct answer (set to zero if no correct answer is listed in the top ten). The other is the success rate, the proportion of queries for which a correct answer appeared in the engine's top ten.

3 Results

Figure 1 shows the mean reciprocal rank achieved by the engines. Figure 2 shows the success rate achieved by the engines. Table 1 lists ranks at which correct answers were returned by the engines.

Considering the mean reciprocal rank (MRR) performance of all 20 engines, a multiple analysis of variance (MANOVA) confirms that there is a significant difference in the performance of the search engines on this task. $F(19, 76) = 44.68, p < 0.001$.

Multiple pairwise comparisons using the Least Significant Difference test were conducted. Fast was significantly better than all engines except Google ($p < 0.05$).

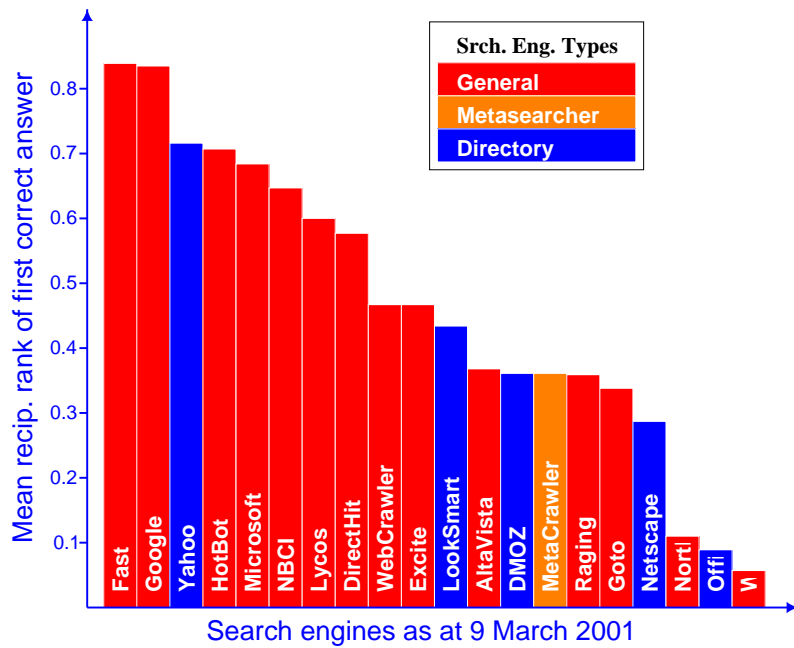


Figure 1: Mean reciprocal rank achieved by the engines.

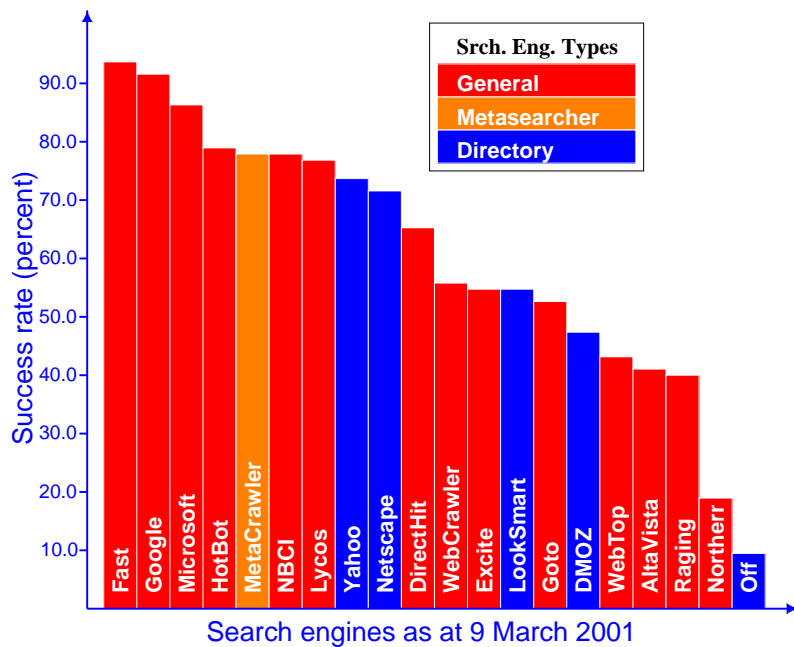


Figure 2: Success rate achieved by the engines. The proportion of the 95 queries for which a correct answer appeared in the top ten results.

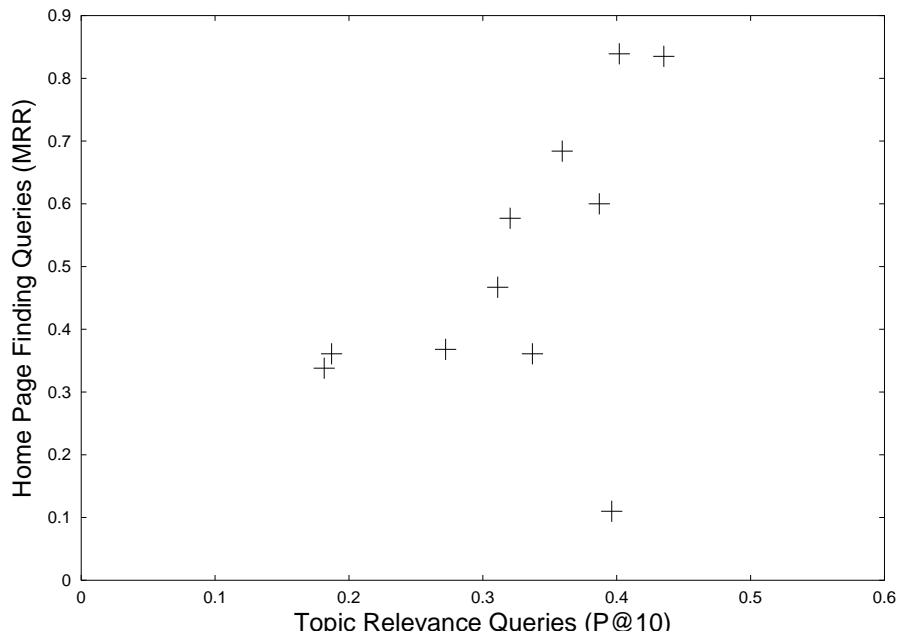


Figure 3: Scatter plot of site finding effectiveness (MRR) against topic relevance effectiveness (precision at 10). Only engines from [3] are included, since we do not have topic relevance results for the others.

Figure 3 shows, for the 11 engines used in our WWW10 study [3], a scatter plot of site finding effectiveness against topic relevance effectiveness. After elimination of the obvious outlier (NorthernLight), the Pearson r correlation between topic relevance P@10 and site finding MRR is .841 which is significant at the .01 level.

4 Discussion

Engines face two obstacles to effective site finding. One is a problem of omission. If the required site is missing from the engine’s index, it can not return it. The engine affected most by this problem was OfficialSearch, which did not list the majority of airline sites so had no chance of returning them. Yahoo! performed much better in this respect because it has a more comprehensive directory of sites, and also falls back on Google if it finds no directory match.

The other problem is one of ranking. For example, NorthernLight probably indexes many of the correct answer pages. However, its ranking methods fail to produce them in the top ten for over 80% of queries.

This experiment was based on a site finding task, as opposed to our previous topic relevance experiments [3, 2, 4]. The scatter plot in Figure 3 shows a strong correlation between performances in the two tasks. The only exception is NorthernLight, which performed far better in the topic relevance task. This may be because its ranking methods are not tuned for site finding.

An engine not in the scatter plot, but which did perform poorly in an earlier topic relevance experiment [2] was Yahoo!. However, it is not surprising that Yahoo!, a directory of Web sites, performs well in a site finding task.

5 Conclusions and Caveats

We have evaluated the site finding effectiveness of 20 engines. There were dramatic differences in performance between engines. However, the differences were *for a particular set of (airline site) queries and effectiveness measures, at the time we actually submitted the queries (9 March 2001)*. It is important to note that effectiveness of engines can vary considerably over time. Furthermore, this type of effectiveness evaluation does not take into account query response time or user interface design, which may be of considerable importance to users.

References

- [1] Nick Craswell, David Hawking, and Stephen Robertson. Effective site finding using link anchor information. Submitted for publication, 2001.
- [2] David Hawking, Nick Craswell, Peter Bailey, and Kathy Griffiths. Measuring search engine quality. *Information Retrieval*, 2001. In Press.
- [3] David Hawking, Nick Craswell, and Kathleen Griffiths. Which search engine is best at finding online services? WWW10 Poster, 2001.
- [4] David Hawking, Nick Craswell, Paul Thistlewaite, and Donna Harman. Results and challenges in Web search evaluation. In *Proceedings of WWW8*, pages 243–252, 1999.

A Queries and correct answers

AOM-Minerve
<http://www.aom.com>
<http://www.aom-minerve.fr/>
<http://www.aom.fr/>

Aer Lingus
<http://www.aerlingus.ie/>
<http://www.aerlingus.com/>
<http://www.airlingus.ie/>

Aeroflot
<http://www.aeroflot.ru>

Aeromexico
<http://www.aeromexico.com>
<http://www.aeromexico.com.mx/>

Air Afrique
<http://www.airafrique.com/>

Air France
<http://www.airfrance.fr/>

Air Littoral
<http://www.air-littoral.fr/>
<http://www.air-littoral.com/>
<http://www.airlittoral.com/>

Air Malta
<http://www.airmalta.com/>

Air Mauritius
<http://www.airmauritius.com>
<http://www.air-mauritius.com/>

Air Namibia
<http://www.airnamibia.com.na/>

Air New Zealand
<http://www.airnz.co.nz>
<http://www.airnewzealand.co.nz/>

Air Ukraine
<http://www.airukraine.com>

Air Vanuatu
<http://www.pacificislands.com/airlines/vanuatu.html>

AirLiban
<http://www.mea.com.lb/>

Alaska Airlines
<http://www.alaska-air.com/>
<http://www.alaskaair.com/>
<http://www.alaskaairlines.com/>

Alitalia
<http://www.alitalia.it/>

Aloha Airlines
<http://www.alohaair.com>
<http://www.alohaairlines.org/>
<http://www.alohaair.com/aloha-air>
<http://www.alohaair.com/aloha-air/>

America West Airlines
<http://www.americawest.com/>

American Airlines
<http://www.aa.com>
<http://www.americanair.com/>

Ansett Australia
<http://www.ansett.com.au/>
http://www.ansett.com.au/home_f.htm

Arkia
<http://www.arkia.co.il/>

Atlas Air
<http://www.atlasair.com>

Avianca
<http://www.avianca.com.co>

Braathens
<http://www.braathens.no/>

British Midland Airways
<http://www.iflybritishmidland.com/>
<http://www.britishmidland.co.uk/>
<http://www.britishmidland.com/>
<http://www.flybmi.com/>

COPA Airlines
<http://www.copaair.com>

Cargolux Airlines
<http://www.cargolux.com>
<http://www.cargolux.com/>

Cathay Pacific Airways
<http://www.cathaypacific-air.com/>
<http://www.cathaypacific.com/>

China Eastern Airlines
<http://www.ce-air.com>
<http://www.cea.online.sh.cn/>

Compania Mexicana de Aviacion
<http://www.mexicana.com>
<http://www.mexicana.com.mx/>

Cronus Airlines
<http://www.cronus.gr/>
<http://www.cronus-airlines.com/>

Cubana de Aviacion
<http://www.cubana.cu/>

Cyprus Airways
<http://www.cyprusair.com.cy>
<http://www.cyprusair.com/>

Czech Airlines CSA
<http://www.csa.cz/>
<http://www.czech-airlines.com/>

Delta Air Lines
<http://www.delta-air.com/>
<http://www.delta.com/>
<http://www.delta-air.com/home/index.jsp>
<http://delta-airlines.com/home/index.jsp>
<http://www.deltaairlines.com/home/index.jsp>

Deutsche Lufthansa
<http://www.lufthansa.com/>

El Al
<http://www.elal.co.il/>
<http://www.elal.com/>

Estonian Air
<http://www.estonian-air.ee/>

Eurowings
<http://www.eurowings.de/>

Finnair
<http://www.finnair.fi/>

Flight West Airlines
<http://www.flightwest.com.au>
<http://www.fltwest.com.au/>

Garuda
<http://www.garuda-indonesia.com>

Hazelton Airlines
<http://www.hazelton.com.au>

Hong Kong Dragon Airlines
<http://www.dragonair.com/>

Iberia
<http://www.iberia.com/>

Icelandair
<http://www.icelandair.net>
<http://www.icelandair.com/>

Indian Airlines
<http://www.indian-airlines.nic.in>

Inter-Aviation Services
<http://rapidttp.com/travel/br/zinterai.html>
<http://www.rapidttp.co.za/travel/br/zinterai.html>

Iran Air
<http://www.iranair.co.ir/>
<http://www.iranair.com/>

Israel Airlines
<http://www.elal.co.il/>
<http://www.elal.com/>

Jersey European Airways
<http://www.jea.co.uk/>
<http://www.british-european.com/>
<http://www.jersey-european.co.uk/>

Jugoslovenski Aerotransport
<http://www.jat.com>
<http://www.jat.co.yu/>

KLM
<http://www.klm.com>

Kendell Airlines
<http://www.kendell.com.au>

Korean Air Lines
<http://www.koreanair.com/>

Kuwait Airways
<http://www.kuwait-airways.com>

LOT Airlines
<http://www.lot.com/>
<http://www.lot.com.pl/>

LTU International Airways
<http://www.ltu.de/>

Ladeco Airlines
<http://www.ladeco.com>
Lauda Air
<http://www.laudair.com/>
Lineas Aereas Privadas Argentinas
<http://www.lapa.com.ar>
Lufthansa Cargo
<http://www.lhcargo.com>
<http://www.lh-cargo.com/>
<http://www.lufthansa-cargo.com/>
<http://www.lufthansa-cargo.de/>
Lufthansa CityLine
<http://www.lhcityline.com>
<http://www.lh-cityline.com/>
Luxair
<http://www.luxair.lu/>
<http://www.flyluxair.com/>
Maersk Air
<http://www.maersk-air.com>
<http://www.maersk-air.dk/>
<http://www.maerskair.com/>
<http://www.maerskair.dk/>
Malaysian Airline System
<http://www.malaysiaairlines.com.my>
<http://www.malaysia-airlines.com/>
Malev Hungarian Airlines
<http://www.malev.hu>
<http://www.malev.hu/ew/>
<http://www.malev-airlines.com/>
Manx Airlines
<http://www.manx-airlines.com/>
Meridiana
<http://www.meridiana.it>
Middle East Airlines
<http://www.mea.com.lb/>
Nippon Cargo Airlines
<http://www.ananet.or.jp/nca/>
<http://www.ananet.or.jp/nca>
Pakistan International Airlines
<http://www.fly-pia.com>
Pluna Lineas Aereas Uruguayas
<http://www.pluna.com.uy>
<http://www.pluna.com.uy/index2.htm>
Polish Airlines
<http://www.lot.com/>
<http://www.lot.com.pl/>
Portugalia
<http://www.pga.pt/>
<http://pga.pt/pt>
Qantas Airways
<http://www.qantas.com.au/>
<http://www.qantas.com/>
Regional Airlines
<http://www.regionalairlines.com>
Royal Dutch Airlines
<http://www.klm.com>
Russian Airlines
<http://www.aeroflot.ru>
SABENA
<http://www.sabena.com/>
<http://www.sabena.com/home.html>
SATA Air Acores
<http://www.virtualazores.com/sata>
<http://sata.pt/>
<http://virtualazores.com/sata/>
Shanghai Airlines
<http://www.shanghai-air.com/>
Singapore Airlines
<http://www.singaporeair.com/>
<http://www.singaporeair.com/home.htm>
Skyways
<http://www.skyways.se>
<http://www.skyways.com/>
SriLankan Airlines
<http://www.airlanka.com/>
<http://www.airlanka.com/index2.html>
<http://www.lanka.net/Airlanka>
Sunflower Airlines
<http://www.fijiguide.com/Sunflower/sunad.html>
<http://www.fiji.to/>

Swissair
<http://www.swissair.com/>
Thai Airways
<http://www.thaiair.com/>
<http://www.thaiairways.com/>
Trans-Mediterranean Airways
<http://www.tma.com.lb>
Transavia Airlines
<http://www.transavia.nl>
<http://www.transavia.nl/home>
US Airways
<http://www.usair.com/>
Ukraine International Airlines
<http://www.ukraine-international.com>
<http://www.ukraine-international.com/eng/>
<http://www.ukraine-international.com/eng>
Viacao Aerea Sao Paulo
<http://www.vasp.com.br/>
Virgin Atlantic Airways
<http://www.fly.virgin.com/>
<http://www.virgin-atlantic.com/>
Wideroe's Flyveselskap
<http://www.wideroe.no>

B Engines

altavista: <http://search.altavista.com/>
directhit: <http://www.directhit.com/>
dmoz: <http://search.dmoz.org/>
excite: <http://search.excite.com/>
fast: <http://www.alltheweb.com/>
google: <http://www.google.com/>
goto: <http://www.goto.com/>
hotbot: <http://hotbot.lycos.com/>
looksmart: <http://www.looksmart.com/>
lycos: <http://www.lycos.com/>
metacrawler: <http://search.metacrawler.com/>
microsoft: <http://search.msn.com/>
nbc: <http://www.nbc.com/>
netscape: <http://search.netscape.com/>
northernlight: <http://www.northernlight.com/>
officialsearch: <http://officialsearch.com/>
raging: <http://ragingsearch.altavista.com/>
webcrawler: <http://search.excite.com/>
webtop: <http://www.webtop.com/>
yahoo: <http://search.yahoo.com/>