How does Google search for everything?

Computer Science at Work

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How does one search for an item?

• Data must be organized in some way
• Sorting alphabetically (or numerically) is one way
  – Sorting by height – compare the two ways we sorted
  – Demo several sorting algorithms
    • Selection sort
    • Insertion sort
    • Shell sort

• There are other ways to organize data!
Sorting Network
Sort numbers (largest at bottom) using comparators in parallel

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Sorting Network

different setup for comparators
Sort numbers (largest at bottom)

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Google Search Query

1. The web server sends the query to the index servers. The content inside the index servers is similar to the index in the back of a book - it tells which pages contain the words that match the query.

2. The query travels to the doc servers, which actually retrieve the stored documents. Snippets are generated to describe each search result.

3. The search results are returned to the user in a fraction of a second.
Computer Science at work behind the scenes!

• Googlebot web crawler
  – Finds and retrieves pages
  – Gives pages to google indexer
“how” “google” “search” “works”

How Google Works - Google Guide
Feb 2, 2007 ... Google gives more priority to pages that have search terms near each other ... For more information on how Google works, take a look at the ...
www.googleguide.com/google_works.html - Cached - Similar

Google Technology
The heart of Google's search technology is PigeonRank™, a system for ranking web pages ... Building upon the breakthrough work of B. F. Skinner, ...
www.google.com/technology/pigrerank.html - Cached - Similar

Corporate Information - Technology Overview
The software behind our search technology conducts a series of simultaneous ... The life span of a Google query normally lasts less than half a second, ...
www.google.com/corporate/tech.html - Cached - Similar

Show more results from www.google.com

HowStuffWorks "The Google Search Engine"
The Google search engine allows you to find just about anything you can think of on the Internet. Learn more about the Google search engine.
computer.howstuffworks.com/google1.htm - Cached - Similar

HowStuffWorks "How Internet Search Engines Work"
Internet search engines do your research for you. Learn how internet search engines like Google work, how internet search engines build an index and what ...
computer.howstuffworks.com/search-engine1.htm - Cached - Similar

The Anatomy of a Search Engine
The Google search engine has two important features that help it produce high ...... That works out to be about 350 terabytes. Also assume that indexing a ...
info.slab.stanford.edu/~backrub/google.html - Cached - Similar
Page Rank Algorithm

Google - Search results for "miley cyrus"

News results for miley cyrus
- Billy Ray Cyrus Raps for Miley’s Twitterers - 11 hours ago
- Miley Cyrus rapped about leaving Twitter, so why shouldn’t Billy Ray Cyrus rap about stickin’ around? Anything Miles can do, dad can do better, right? ...
- E! Online - [276 related articles]
- Miley Cyrus raps about why she left Twitter - CTV.ca - [914 related articles]
- Are Miley Cyrus & Penelope Cruz filming with the ladies of Sex...
- Examiner.com - [56 related articles]

MileyCyrus.com - Step Into a Miley State of Mind
- Features news, pictures, audio, video, biography, events, and information on her fan club.
- www.mileycyrus.com/ - Cached - Similar

Miley Cyrus - Wikipedia, the free encyclopedia
- Miley Ray Cyrus [born Destiny Hope Cyrus, November 23, 1992] is an American pop-rock singer and television and film actress. Cyrus is best known for...
- Early life - Career - Entrepreneurship - Philanthropy
- en.wikipedia.org/wiki/Miley_Cyrus - Cached - Similar

Miley Cyrus
- John Mayer Endorses Miley Cyrus Exit From ‘The Hat-rix’: The MTV News Quote Of The Day ..... Find where Miley Cyrus is credited alongside another name ...
- www.imdb.com/name/nm1415323/ - Cached - Similar

Image results for miley cyrus - Report images
Correction Algorithms

Did you mean: computer science
Google is all about problem solving and writing algorithms

- Algorithms must happen fast!
- Compare the two sorting algorithms we did
- Want efficient, fast algorithms!

- No one wants to wait on a search query!
Computer Science Research at Duke

• Microscopic robots
  – assembling self organized structures
• Smart Phone surround sense App
  – Using algorithms to figure out your exact location
  – Better than GPS
• Building networks for the future
  – Large scale experimental network
• Virtual World (Classroom) with students from Duke and China
My research - Making theoretical concepts come alive – visualize and interact with!