Internet as an Information & Communication Utility:

It’s Getting Personal

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Overview

• Background
  – From Email to Twitter and Beyond
  – Simon’s Law: Information and Attention
  – The Need for Personalization

• Personalized Information Discovery
  – Web Search: Challenges
  – Personalized Search

• Toward a Solution to Information Personalization
  – Information Search Is only the First Step…
  – Internet as a Personal Information & Communication Utility
Overabundance and Exponential Growth of Internet Information

But the tools we use to find or manage information and make decisions have stayed basically the same.

The type, scope, & amount of Web information has changed radically:
• 5 new web sites added per second
• Blogs double every 6 months
• 247 billion emails are sent per day in 2009
Information Discovery & Management

Yesterday

Taxonomy
Hierarchical folders

*Examples:* Yahoo, Desktop storage, Xdrive, and Box.net

Today

Folksonomy
Collective Intelligence
Social Tagging
Google Search & Syndication

*Examples:* Google, Delicious, and Digg

Tomorrow

?
Simon’s Law of Information

The rapid growth of information causes scarcity of attention

"... a wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it."

-- Herbert Simon, 1971
Attention and Personalization

• Attention Crisis
  – Information imbalance between publishers and consumers.
    • Information publishers: Information does not get desired attention
      => hurting their economy
    • Information consumers: Consumers do not get the desired information
      => impacting their decision-making
  – There is an urgent need to allocate attention efficiently among the overabundance of information sources

• Personalization
  – Adapts to the individual needs, interests, and preferences for information consumers by matching the right information to their attention.
  – An individually-tailored process for bringing the most relevant information to the attention of information consumers
  – A win-win for both publishers and consumers to achieve information balance
Web Search: Finding Information

- Spider = Crawler -- collects the documents
- Indexer -- process and represents the data
- Search interface -- answers queries

User

Web spider

The Web

Indexes

Indexes

Ad indexes

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Microsoft: 50% Searches Fail to Deliver

• Users are dissatisfied:
  – 50% searches fail to meet consumer’s needs
  – 35% of people express dissatisfaction with search today

• Users need extra effort:
  – 72% of people thought current search results are disorganized
  – Half of all search queries are a repeat of a previous search
  – Half the searches are eventually refined

• Users are focused more on tasks and decisions
  – 66% of people reported using search engines to make decisions
  – Long sessions (> 30 minutes) are becoming more common
Challenges of Web Search: Web

• Dynamic Web
  – The Web is really infinite - Only a fraction of Web can be indexed
  – 5 new web pages are added per second
  – Lack of stability: 25% updates per day and 40% per week
  – High linkage: > 8 links per page

• Diverse Web
  – Diverseness in standard compliance and hosting technologies
  – Heterogeneity: types, quality, languages
  – Duplication: syntactic and semantic – 40% pages are duplicates
  – Others: Spider traps

• SEO, self-linking, cloaking, doorway page, or other spamming measures affects search results and ranking
Challenges of Web Search: User Behaviors

- Diverseness in access and search methodologies
  - Bandwidth and access device
  - Search, search + browse, and filter
- Wide variance in search knowledge and behaviors
  - Queries: short, imprecise, obscure, ambiguous, bad syntax
  - 85% only look over one result page
- Diverseness in search needs:
  - Informational – seek general information on a broad topic (~25%)
  - Navigational – seek a particular website or homepage (~40%)
  - Transactional – want to do something (~35%)
Why Don’t the Users Get What They Want?
One-Size-Fit-All Solution

- User A wants to know “Apple computer”
- User B wants to know “apple as fruit”
Why Don’t the Users Get What They Want?  
Semantic Obscurity

Example

I need to get rid of mice in the basement

What’s the best way to trap mice alive?

mouse trap

Software, toy cars, inventive products, etc
Requirements for Personalized Search: Users

• Search with simple or short queries
• Recommendations
  – Automatic query refinement or generation
  – Search executed on schedule or as needed
• Relevant quality results
  – come from credible Web sites
  – represent the most recent information available
  – remain absolutely relevant to the users
  – are top ranked
Requirements for Personalized Search: Search Engine

- Offline user profile generation
  - Based on attention data
  - It is updated on schedule or as needed
  - It is used to
    - enhance queries and results
    - resolve ambiguity in queries and results
    - determine appropriate search sources and scopes

- Real-time query processing
  - Filter and refine queries
  - Automatically generate query based on personal profile
  - Semantically and syntactically re-define and enhance queries

- Crawling and indexing
  - Smart scheduling to insure freshness of the relevant information
    - Challenge: crawling 1B pages in a month => 400 pages per second

- Results and ranking are tailored to meet user’s need
A Personalized Search System

- Semantic Technology
- Machine Learning
- Cybernetics

User Attention

Page 15
09/09/09
General Search v.s. Personalized Search

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Issues with Personalized Search

• **Relevancy & Reliability**
  – Is the attention information “clean” and up-to-date?
    • Machine-learned models prone to catastrophic errors (Google)
  – Are the search results recent and available?
    • Are the indexes for long-tailed information up-to-date?

• **Privacy**
  – Protect consumers information
  – Put the user in control of his/her information
  – The user chooses what services to receive, and in exchange for what attention information
Evolution of Information Discovery & Management

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Tomorrow

Semantics & Personalization
Machine Intelligence
Ad-hoc & Time Machine
Personalized Search & Syndication

Anchora
Information Utilization Is Beyond Search

Stay Connected with Information that Matters

• **Find** your relevant quality information persistently
  – Search and Browse

• **Aggregate** your information dynamically
  – Acquire and organize

• **Deliver** your information instantly
  – Retrieve and share
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Summary

• The Need for Personalization
• Personalized Information Search
• Internet as a Personal Information & Communication Utility
  – Find
  – Aggregate
  – Deliver