The World-Wide Web: Quagmire or Goldmine?

Oren Etzioni

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Presentation Credits:
Shabnam Sobti

Agenda

- Prelude: *The Internet Story*
- Article Review: *Mirrored Reflections*
- An Individual View: *Multiple Facets*
- Intermediate Development and Future Scope: *Roadmapping the Third Front*
- Sum - up: *Cadenza*

The Internet Story

"The time has come, the Walrus said,
To talk of many things.
Of shoes and ships and sealing wax-
Of cabbages and kings."

→ *Lewis Carroll*
"Through the Looking Glass"

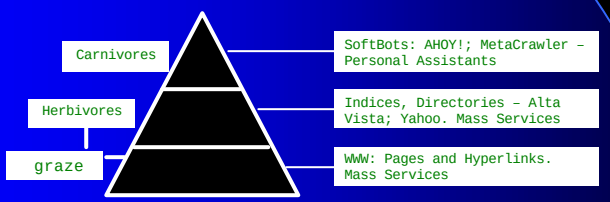
- Expansion: necessity
- ? Moral ? "..... will anybody really live happily ever after?"

Mirrored Reflections: The Article's Perspective

"Fine goals matter less than the right strategy."

→ *Stanley Hoffman*

Information Food Chain



Mirrored Reflections: Introduction / 1

- **Basic Question:** "Is Information on the Web sufficiently well-structured to facilitate effective Web Mining?"
- **Issues:**
  - Buried information in Data Mining.
  - No machine readable semantics.
- **Possible Solutions:**
  - Transform Web into massive, layered database.
  - Hand-code specific wrappers.

Mirrored Reflections: Introduction / 2

- **Alternative** → Structured Web Hypothesis
- **Structure:**
  - Linguistic & typographic conventions.
  - HTML annotations
  - Classes of semi-structured documents
  - Web indices, directories, etc.
- **Organization of Web Mining:**
  - Resource Discovery
  - Information Extraction
  - Generalization

Mirrored Reflections: Resource Discovery / 1

- 2 classes of web resources:
  - Documents
  - Services
  - Focus: automatic creation of searchable web indices.
  - Egs:
    - Alta Vista
    - MetaCrawler

Mirrored Reflections: Resource Discovery / 2

- **AltaVista - Characteristics:-**
  - Massive memory and network bandwidth requirements
  - Cost of resources is curtailed
  - Independent queries; no customization
  - Homogenised, LCD service
- **AltaVista - Attributes:-**
  - Scan documents – store index of words
  - Ask for indexed documents using keywords
- **AltaVista - Drawbacks:-**
  - Repetition of queries
  - Irrelevant responses

Mirrored Reflections: Resource Discovery / 3

- **MetaCrawler – Characteristics:-**
  - Interface and query language
  - Collation and pruning
  - Local phrase search
  - Web services and interfaces decoupling
  - Meta interface - benefits:
    - Modest access
    - Customization
    - No need to downsize 'smartness'
- **MetaCrawler – Evolution Scope:-**
  - Document clustering
  - Mixed-initiative dialog

Mirrored Reflections: Resource Discovery / 4

- **Future** resource discovery systems:
  - Automatic text categorization
  - Automatic construction of web directories
  - Filter query results to searchable indices

Mirrored Reflections: Information Extraction / 1

- **Challenge:** automatic extraction of information from a discovered source.
- **Current status:**
  - Identify fixed set of resources
  - Hand coded wrappers for parsing
- **Need:** dynamic extraction from unfamiliar sources

Mirrored Reflections: Information Extraction / 2

- **Harvest:-**
  - Models of semi-structured documents.
  - No discovery of new documents.
  - No learning of new models of document structure.
  - Easy handling of familiar types.

Mirrored Reflections: Information Extraction / 3

- **FAQ-Finder:-**
  - More potential of returning higher quality information.
    - Semi-structured files
    - Smaller number of files
- **Limitations [both]:-**
  - Focus on documents; ignore services
  - Pre-specified description

Mirrored Reflections: Information Extraction / 4

- **Internet Softbots:-**
  - **Test queries + domain specific knowledge = auto learning of web service descriptions**
  - **Egs:**
    - **ILA**
    - **Shopbot**

Mirrored Reflections: Information Extraction / 5

ILA [Internet Learning Agent]:

- Automatic models of declarative learning
- Query unfamiliar resources against known objects
- Competing hypothesis
- Requirements suited for agents having no formal description
- Drawbacks:
  - Category mismatch
  - Token mismatch
  - Conjunctive bias

Mirrored Reflections: Information Extraction / 6

ShopBot - Characteristics:

- Extraction using minimal knowledge
- Ambitious task: learn by querying and response analysis
- Operates in 2 phases:
  - Learning
  - Comparison shopping
- Scalable and robust
- O/P structure and prototypical queries

Mirrored Reflections: Information Extraction / 6

ShopBot:

- **Limitations:**
  - Doesn't understand meaning of description
  - Strong bias
  - Extraction of individual parts
- **Current work:** autonomous discovery of vendor home pages

Mirrored Reflections: Generalizations / 1

- Most m/c learning systems learn about user interests instead of the Web
- Obstacle: Labelling
- Inputs labelled as (+ve) / (-ve) sample
- Techniques so far:
  - Uncertainty Sampling
  - Clustering
- Solution approach: Web is much more than collection of linked documents

Mirrored Reflections: Generalizations / 2

Ahoy! :-

- Harness the power of users
- Queries MetaCrawler and filters its output
- Heuristic filtering algorithm
- Solves labelling problem using user feedback
- Advantages:
  - Rapid collection of learning data
  - Architecture not restricted to particular learning domain

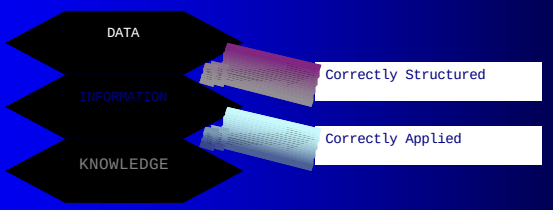
Mirrored Reflections: Conclusions

- Very brief, selective survey
- Intuitive hypothesis proved by citing examples
- Enormous Web potential
- Although the Web is less structured than we think – its not as random as we fear

Multiple Facets: An Individual View / 1

"Technology is the Extension of the Central Nervous System."
→ Marshall Mc.Luhan

- Vannevar Bush



Multiple Facets: An Individual View / 2

- Three sides to every story – yours; theirs and the right one.
  - Effectively an article
  - Written in 1996

Therefore, the hypothesis question is a paradox in itself !!

Roadmapping the IIIrd Front:
Intermediate Development and FutureScope / 1

"The chief reason for progress is the desire of any organism to live beyond its means"

- **SoftBots:**
  - Expectations from Personal Assistants: Robustness; Speed; Added Value
  - Intelligent agents that use s/w tools and services on user's behalf
  - Criticality of AI: Patrick Winston's "Raisin-Bread" model
  - Advantages:
    - Cost, effort, expertise needed is low
    - S/w environments circumvent certain problems
    - Simulated physical worlds take a long time to perfect
  - Eg: Rodney

Roadmapping the IIIrd Front:
Intermediate Development and FutureScope / 2

- **WebML:-**
  - Approach: tailored wrappers that map document features
  - Resource as well as knowledge discovery
  - Interactive querying
  - Assets:
    - Relatively high level concept mapping
    - Unique knowledge discovery power
    - Advantage of MLDB model
  - Takes advantage of MLDB model
    - Propagation algorithm

Roadmapping the IIIrd Front:
Intermediate Development and FutureScope / 3

- **Issues with AI scalability:**
  - Discovery, Extraction, Translation, Evaluation
- **Extraction and Translation:**
  - ShopBot, ILA, Levy & Ordille's model and Semint
- **Discovery:**
  - Agents monitor "what's new"
  - Agents investigate user sent URL(s)
  - Co-operation with existing tools
- **Evaluation:**
  - Source testing
  - Comparison and validation
  - Motro – Rakov model

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Roadmapping the IIIrd Front:
Intermediate Development and FutureScope / 4

- **AUTO-FAQ:-**
  - **Presumption:** cost of acquisition of knowledge too high
  - Cyber leveraging – CYLINA
  - **Features:**
    - Shallow Language understanding
    - Population Leveraging for information acquisition and adaptive information management
    - Q – A orientation
    - Cyber leveraging through: identification of gaps in the infobase, adding knowledge to plug them and gather feedback.

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A Summary

- Structural attributes of the web are subjective
- Point of views of naïve and experienced users, developers
- Data on the web always liable to better reforms – alleviate randomness
- **?** – whether the quagmire can be turned into a goldmine.

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Cadenza
Afterthoughts

- Cannot start with the presumption that the said hypothesis is incorrect.
- Research and development, optimality, scalability, etc. are extensible concepts.
- Therefore, the discussion must not focus on the (in)correctness of the hypothesis – but brainstorm alternative areas of further research.

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