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Semantic Web Technology Evaluation Ontology (SWETO): A Test Bed for Evaluating Tools and Benchmarking Applications

Boanerges Aleman-Meza

Amit P. Sheth

Wright State University - Main Campus, amit@sc.edu

I. Budak Arpinar

Chris Halaschek

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Semantic Web Technology Evaluation Ontology (SWETO): A test bed for evaluating tools and benchmarking semantic applications

WWW2004 (New York, May 22, 2004)
Semantic Web Track, Developers Day

Boanerges Aleman-Meza, Amit Sheth,
I. Budak Arpinar, Chris Halaschek
Large Scale Distributed Information Systems Lab

University of Georgia

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Motivation for SWETO

- Many new techniques and software tools from emerging Semantic Web (SW) community
 - Need a common infrastructure for testing
- Need of an open and freely available ontology with a very large knowledge base
 - Scalability testing as the most important objective
 - Quality and comparability as other criteria

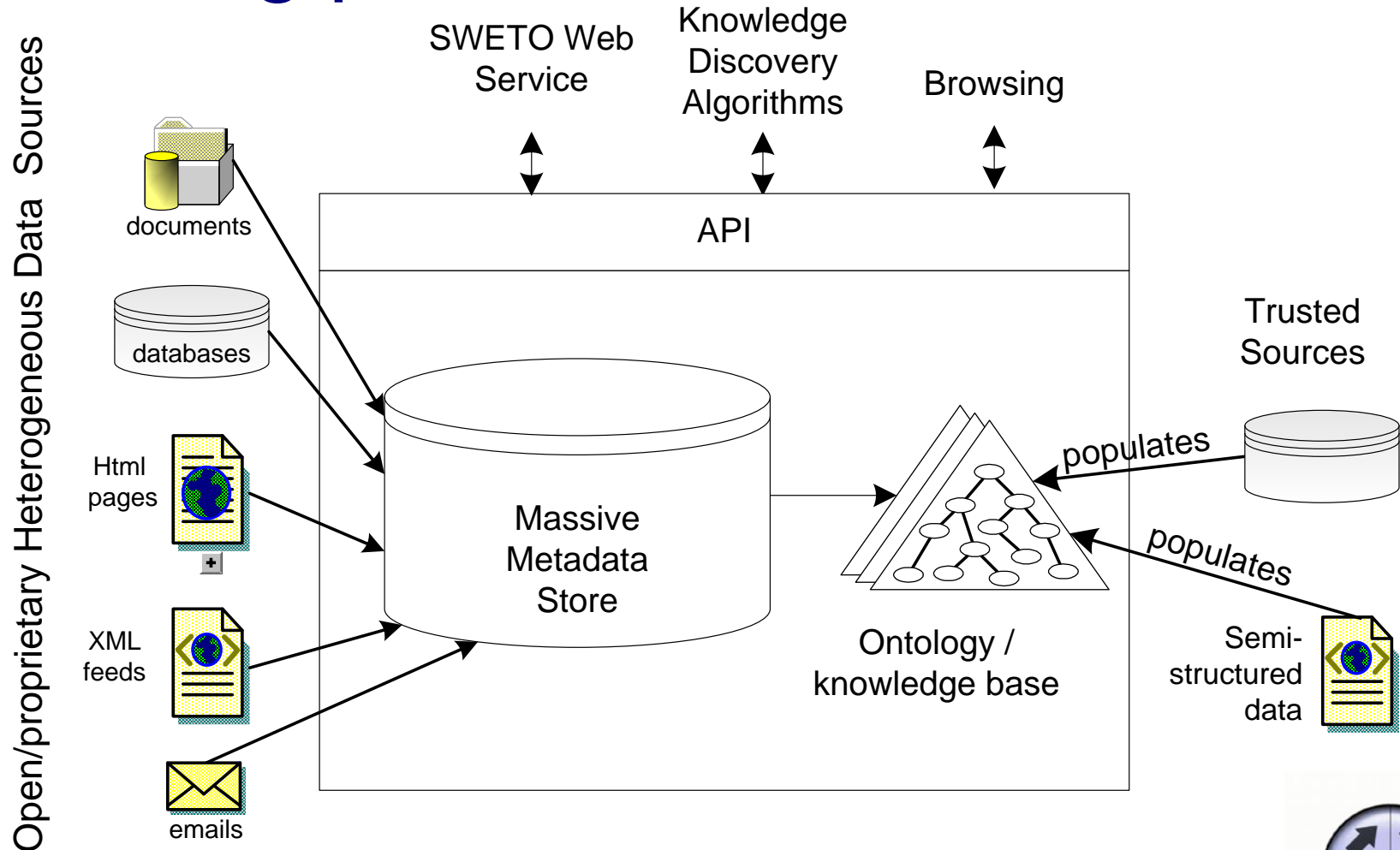


SWETO Objectives

- Develop a broad and deep ontology populated with real facts/data from real world heterogeneous sources
 - the instances in the knowledge base should be highly interconnected
- Serve as a test-bed for advanced semantic applications (i.e. business intelligence, national security, etc.)
- Address the requirements of a research benchmark for semantic analytics, and the semantic techniques of:
 - ontology creation
 - semi-automatic extraction
 - entity disambiguation



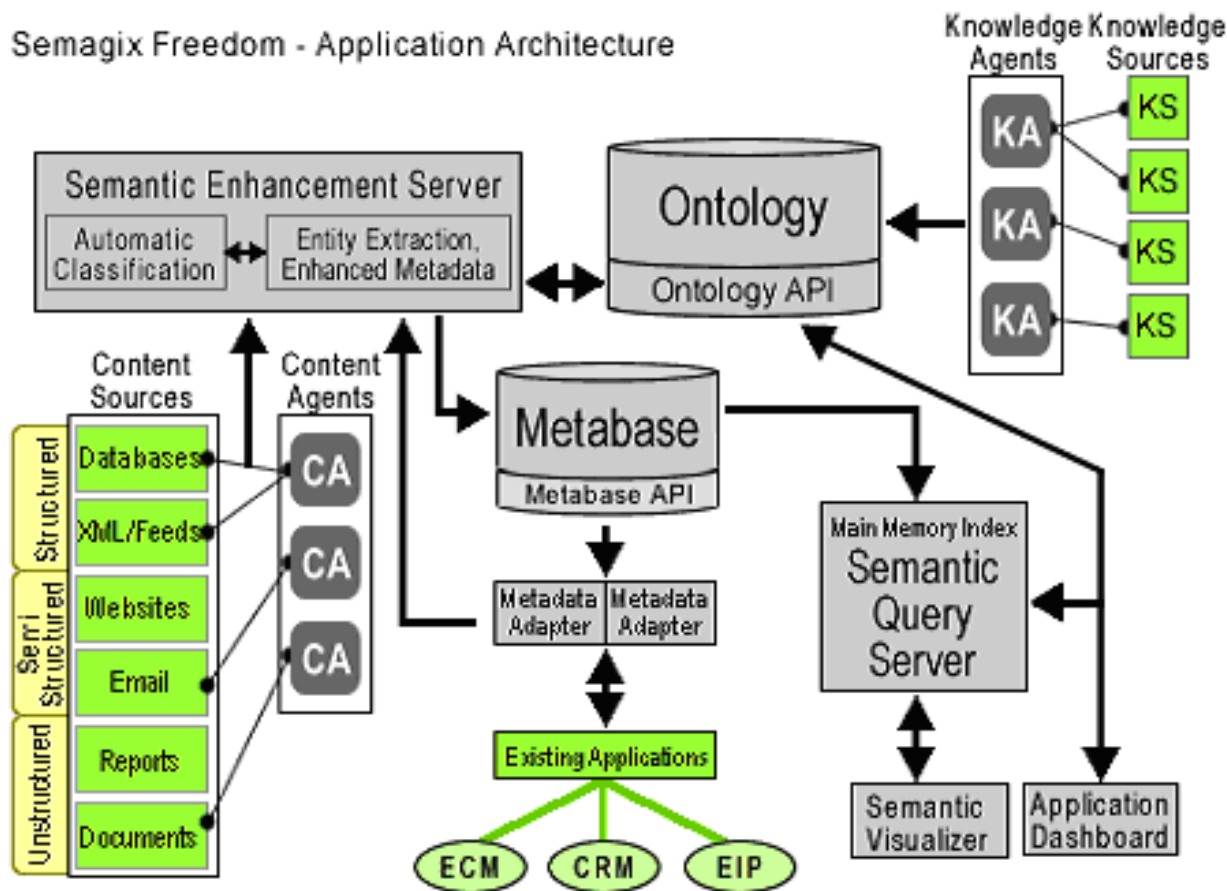
The big picture



Semagix Freedom Architecture

Utilized Semagix Freedom for SWETO ontology design and population

Semagix Freedom - Application Architecture



Development Framework

- Utilized Semagix Freedom for ontology design and population
- With Freedom, knowledge extractors were created to extract entities from various data sources



Development Framework

- Data sources:
 - Selected sources which were highly reliable Web sites that provide entities in a
 - semi –structured format
 - unstructured data with parse-able structures (e.g.,html pages with tables)
 - dynamic web sites with database back-ends
 - Considered the types and quantity of implicit/explicit relationships
 - preferred sources in which instances were interconnected
 - considered sources whose entities would have rich metadata
 - Public and open sources were preferred
 - due to the desire to make SWETO openly available



Development Framework

- As the sources are processed by the extractors, entities are extracted and stored in appropriate classes in an ontology
- Due to heterogeneous data sources, entity disambiguation is a crucial step
 - Freedom's disambiguation techniques automatically resolved entity ambiguities in 97% of the cases, leaving the rest for human disambiguation (and may be ignored)



Development Framework

- Utilize Freedom's API for exporting both the ontology and its instances in either RDF [5] or OWL [2] syntax
- Extractors are scheduled to rerun for keeping the ontology updated



Current Status

- V.1 population includes over 800,000 entities and over 1,500,000 explicit relationships among them
- Continue to populate the ontology with diverse sources thereby extending it in multiple domains, new larger release due soon
- Significant information for provenance/trust support [UMBC partnership]



Current Status – Classes

Subset of classes in the ontology	# Instances
Cities, countries, and states	2,902
Airports	1,515
Companies, and banks	30,948
Terrorist attacks, and organizations	1,511
Persons and researchers	307,417
Scientific publications	463,270
Journals, conferences, and books	4,256
TOTAL (as of January 2004)	811,819



Current Status – Relationships

Subset of relationships	# Explicit relations
located in	30,809
responsible for (event)	1,425
Listed author in	1,045,719
(paper) published in	467,367



Current Status – Disambiguation

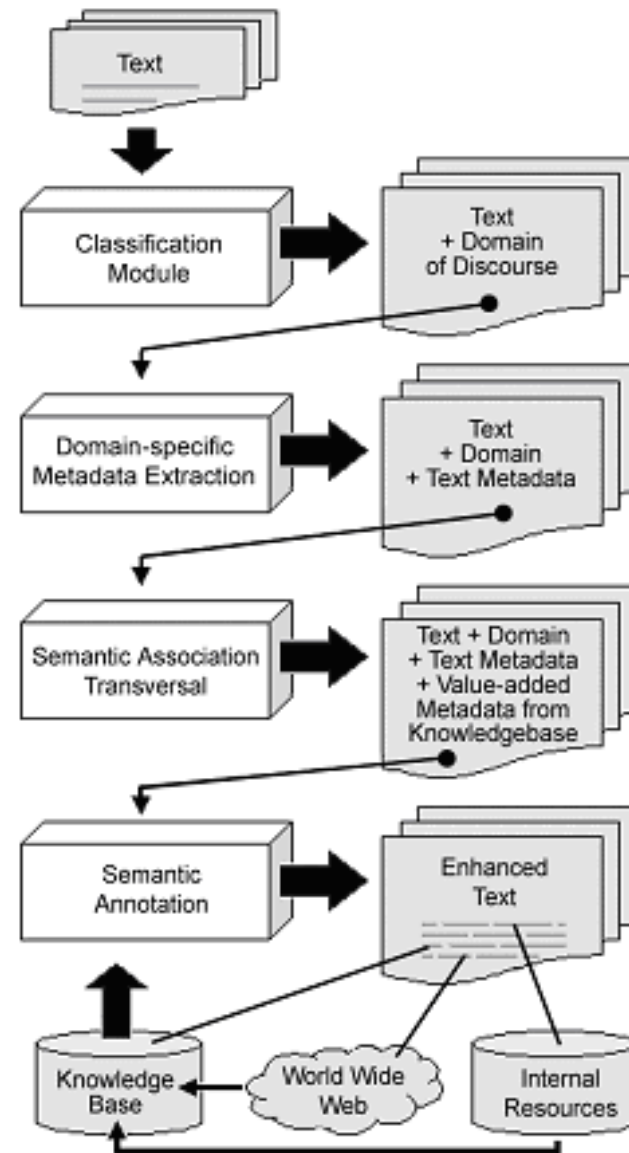
Disambiguation type	# Times used
Automatic (Freedom)	248,151
Manual	210
Unresolved (Removed)	591



Evaluation/ Usage 1: Industry

■ Evaluation of Fast Semantic Enhancement

(in Marianas SDK)



Blue-chip bonanza continues

Dow above 9,000 as [HP](#), [Home Depot](#) lead advance; [Microsoft](#) upgrade helps techs.

August 22, 2002: 11:44 AM EDT

By Alexandra Twin, CNN/Money Staff Writer

[New York](#) (CNN/Money) - An upgrade of software leader [Microsoft](#) and strength in blue chips including [Hewlett-Packard](#) and [Home Depot](#) were among the factors pushing stocks higher at midday [Thursday](#), with the [Dow Jones industrial average](#) spending time above the 9,000 level.

Around 11:40 a.m. ET, the [Dow Jones industrial average](#) gained 65.06 to 9,022.09, continuing a more than 1,300-point resurgence since [July 23](#). The [Nasdaq](#) composite gained 9.12 to 1,418.37.

The [Standard & Poor's 500 index](#) rose 9.61 to 958.97.

[Hewlett-Packard](#) ([HPQ](#): up \$0.33 to \$15.03, Research, Estimates) said a report shows its share of the printer market grew in the second quarter, although another report showed that its share of the computer server market declined in [Europe](#), the [Middle East](#) and [Africa](#).

[Home Depot](#) ([HD](#): up \$1.07 to \$33.75, Research, Estimates) was up for the third straight day after topping fiscal second-quarter earnings estimates on Tuesday.

Tech stocks managed a turnaround. [Software](#) continued to rise after [Salomon Smith Barney](#) upgraded No. 1 software maker [Microsoft](#) ([MSFT](#): up \$0.55 to \$52.83, Research, Estimates) to "outperform"

from "neutral" and raised its price target to \$59 from \$56. Business software makers [Oracle](#) ([ORCL](#): up \$0.18 to \$10.94, Research, Estimates), [PeopleSoft](#) ([PSFT](#): up \$1.17 to \$20.67, Research, Estimates) and [BEA Systems](#) ([BEAS](#): up \$0.28 to \$7.12, Research, Estimates)

all rose in tandem.

competes with

Semantic Annotation

+

Enhancement

[Bancroft, Hammond, Sheth]

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Application 2: Web of Belief (WOB) by UMBC

- Web Of Belief (WOB) framework that maintains trust and provenance for SWETO
 - L. Ding, P. Kolari, A. Joshi, T. Finin, Y. Yesha (UMBC)

Presented at: “Trust on the Web Track”
(also at Developers Day)



Ongoing work

- Quality measures of the ontology
- Access to the ontology
 - Web service
 - Filtering, views and versioning
- On-the-fly semantic annotation

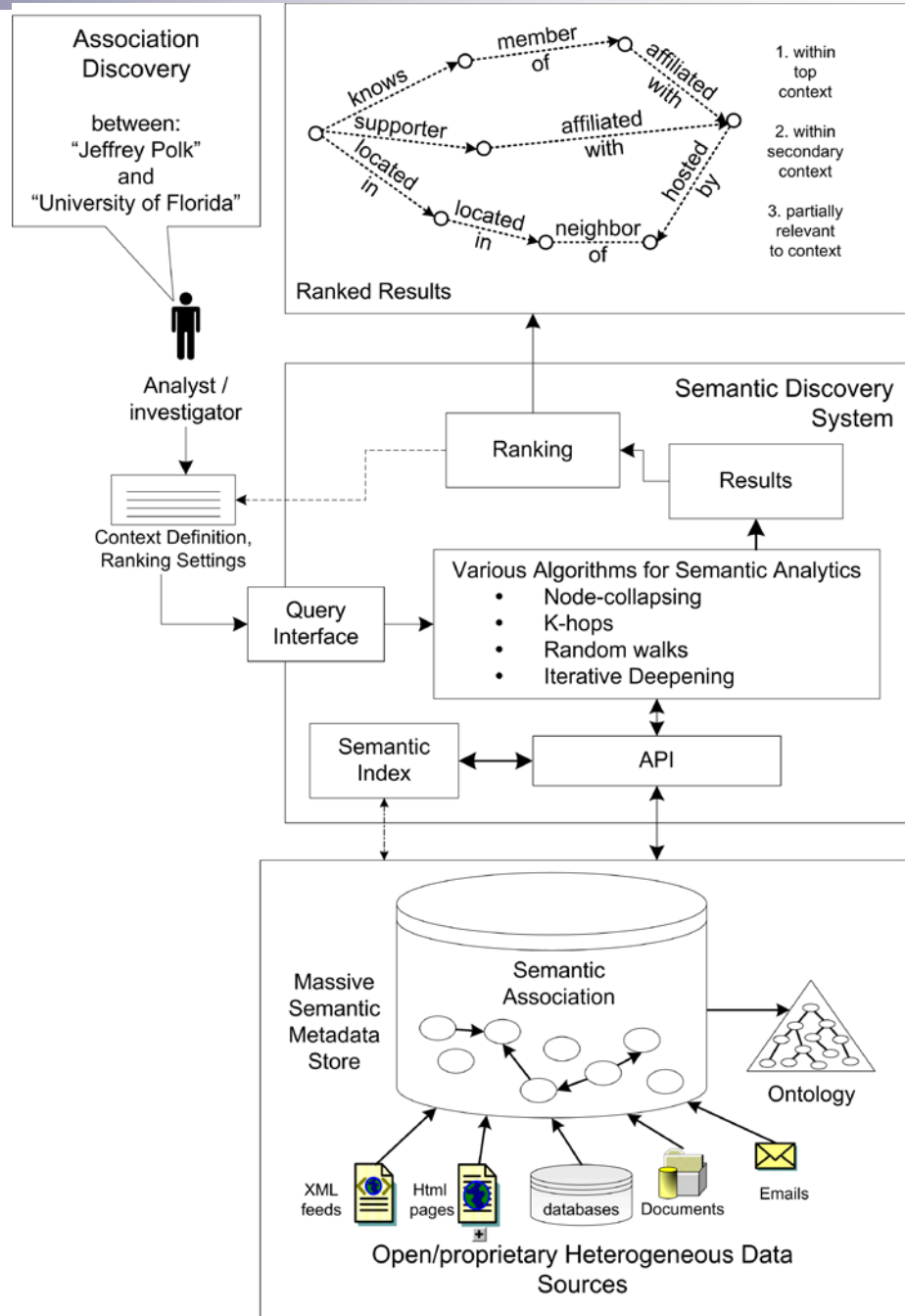


Future plans for benchmarking

- Semantic Search, Browsing and Personalization
- Semantic Portals
 - i.e., *SEMPL* automatically identifies entities
- Semantic Analytics
 - Discovery of *semantic associations* [ρ -operator]
 - Example apps: CIRAS (Semagix), PISTA



Approach to developing Semantic Analytics Application Benchmarking



Conclusions & Future Work

- Using Semagix Freedom, we have created a broad and deep Semantic Web Evaluation Ontology (SWETO)
 - Public access under Creative Commonsense license;
 - Looking for usage, feedback (of all kinds: schema, population, quality), and partners (for developing bechmarks)



Conclusions & Future Work

- More extraction of entities focusing on partners' needs
- Also plan to further investigate the use of semantic similarity for entity disambiguation
- Ontology lifecycle support



SWETO Project Homepage

- <http://lsdis.cs.uga.edu/Projects/Semdis/SWETO/>
 - Google or other search engine: “SWETO”
 - Project description, papers, presentations

- Acknowledgements: This work is partially funded by NSF-ITR-IDM Award #0325464 and NSF-ITR-IDM Award # 0219649.



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