Semanttinen web kansalliseksi voimavaraksi
FinnONTO(2003-2007) hankkeen visio ja tulokset
25th January 2008

QUCCOO & ShOE
Tools for building search ontologies and ontology-based searching in unannotated text collections

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Outline

- 1. Background
- 2. Ontologies
- 3. Quccoo: Searching Unannotated Text Collections through Ontologies
- 4. ShOE: Creating ontologies
- 5. Discussion, Conclusion

1. Background

- Vast online information environments
  - many different natural languages
- Vocabulary mismatch
  - hard to guess the best search keys; leads to loss of search effectiveness
  - especially in foreign languages
  - hard to know word forms, compound treatment
- Other problems – depending on one's search environment
  - collection dependency, metadata dependency
  - engine and query language dependency

2. Ontologies

- Ontologies model semantics
  - concepts
  - rich relationships
  - support inference
  - application means resource annotation
  - closely related to thesauri
- Ontologies can solve the vocabulary problem!
  - represents the semantics of resources (documents) better than pure natural language
  - retrieval becomes correct and accurate
  - desired: a universal world model, and a controlled language for description and reasoning about this model

Issues in Classification and Indexing

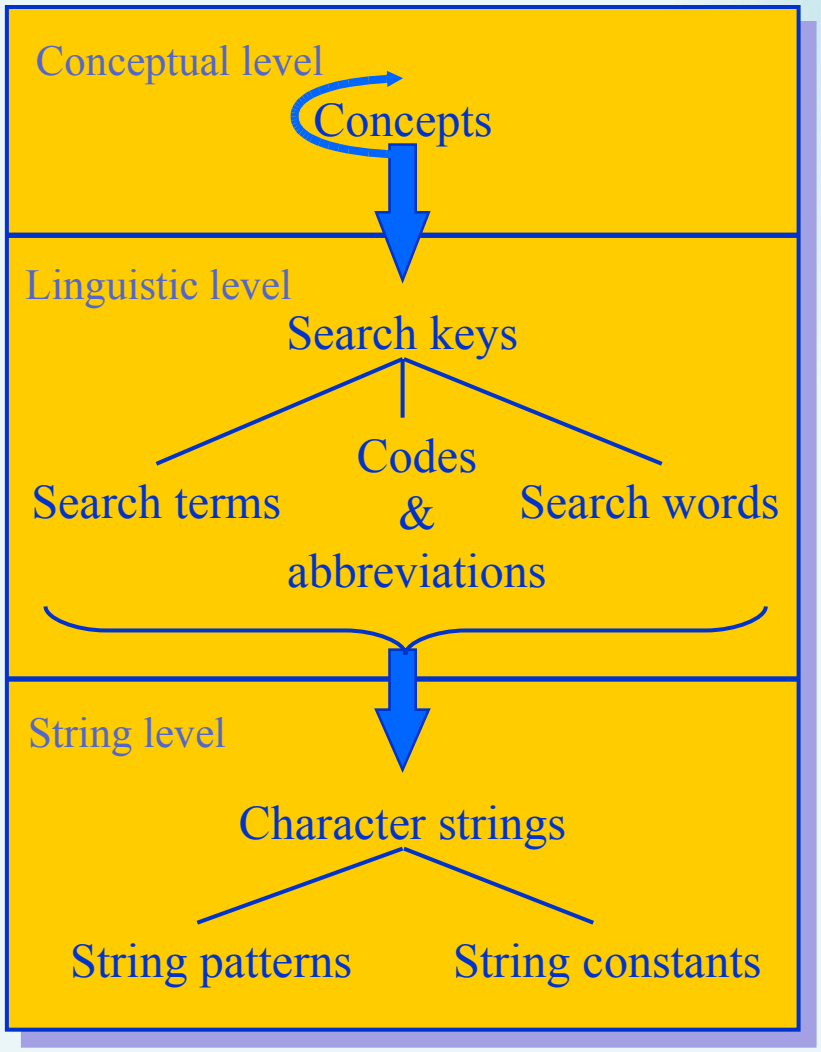
- Index languages -
  - modeling - coverage, viewpoint
  - maintenance - ageing, cost
- Indexing -
  - specificity, exhaustivity, consistency
  - cost - where paid, who pays?
  - The over-specificity the devices created often lead to poor recall and thus they were soon mostly abandoned

Any Room for Ontologies?

3. Searching Unannotated Text Collections through Ontologies

- Searching ontologies can
  - provide conceptual organization
  - support direct access to textual content
    - ✓ translate between concepts and textual variation
    - ✓ translate between natural languages
    - ✓ hide search engines / query languages
    - ✓ may support *other* media / structures / features
  - be light-weight, narrow, and no world models
    - ✓ personal, group or small community support
    - ✓ versions, mutually incoherent, easily modifiable
    - ✓ easily disposable, perhaps tradable

Three levels



- Forest industry
  - forest industry
  - paper industry
  - saw mill
  - ...
  - pl(saw, mill)
  - al(industry)
  - pl(paperi, tehdas)

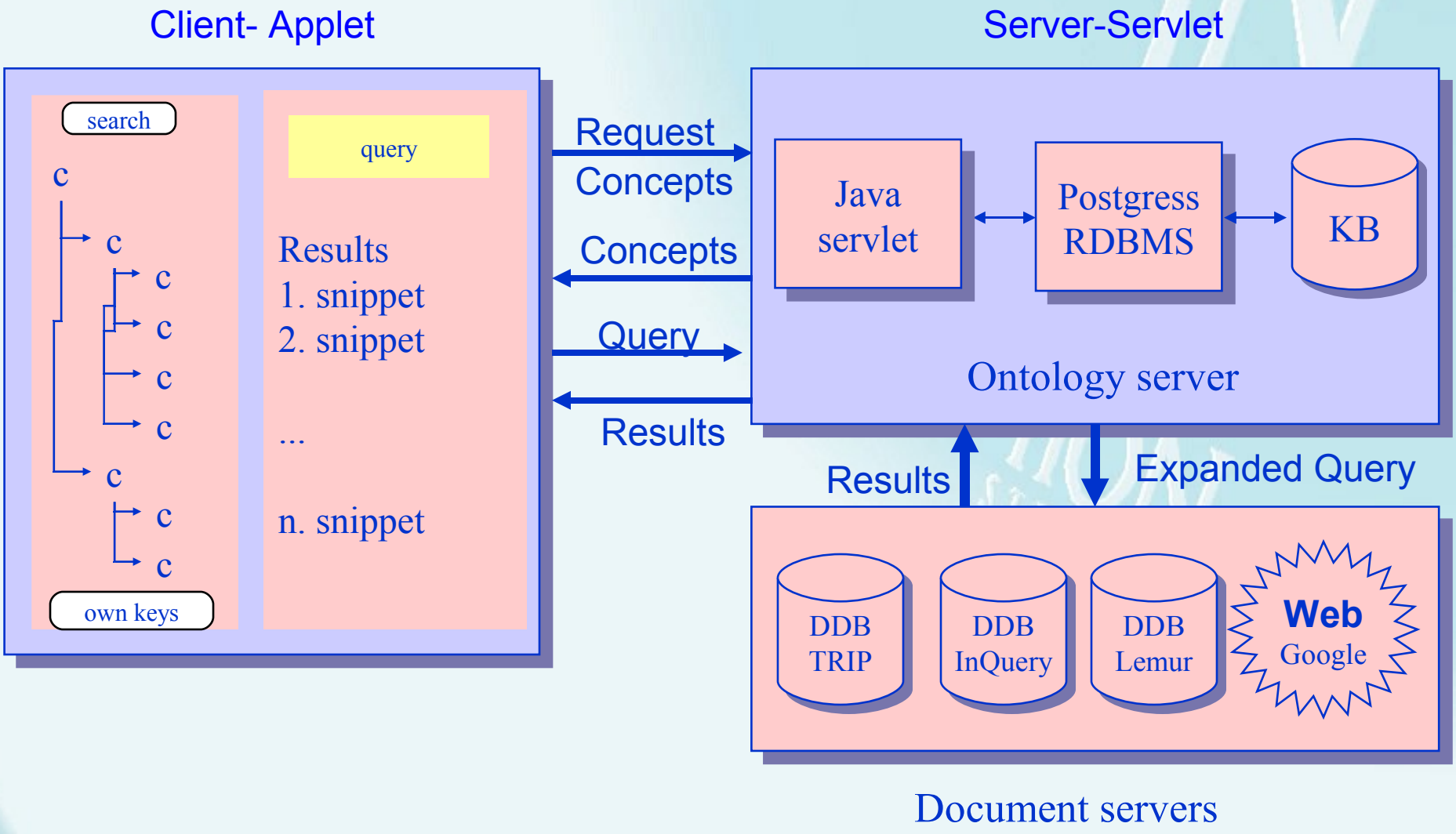
QUCCOO: Principles

- QUCCOO: QUery ConstruCtion with OntOlogies for direct content access
- Based on the three levels …
- Aims to provide *independence* of …
  - expression variability (nutraceutical?)
  - natural language (French?)
  - collection (intranet, Web ,…)
  - indexing (lemmatization, compounds?)
  - availability of metadata & world model
  - engine & query language (Lemur, Trip, Google, …)
- You just select your concepts, targets and go!
  - Point, click and go

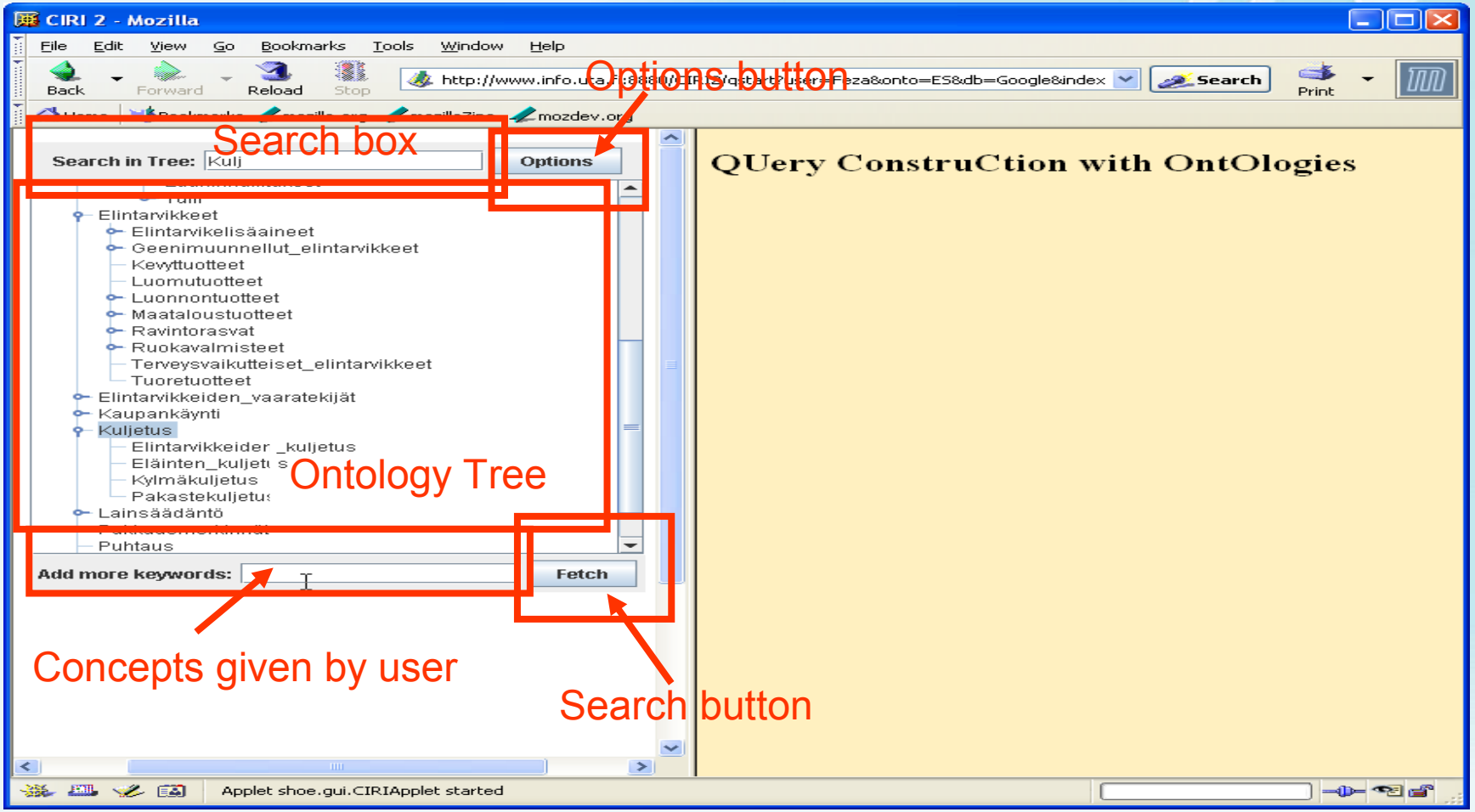
QUCCOO: Status

- Web application, uses state-of-the-art Servlet technology
- Supports diverse full-text database engines (Trip, InQuery, etc.) as well web search engines (e.g., Google)
- Supports diverse collections
- Intuitive; simple interface to access information
- Supports multilingual search and various index types

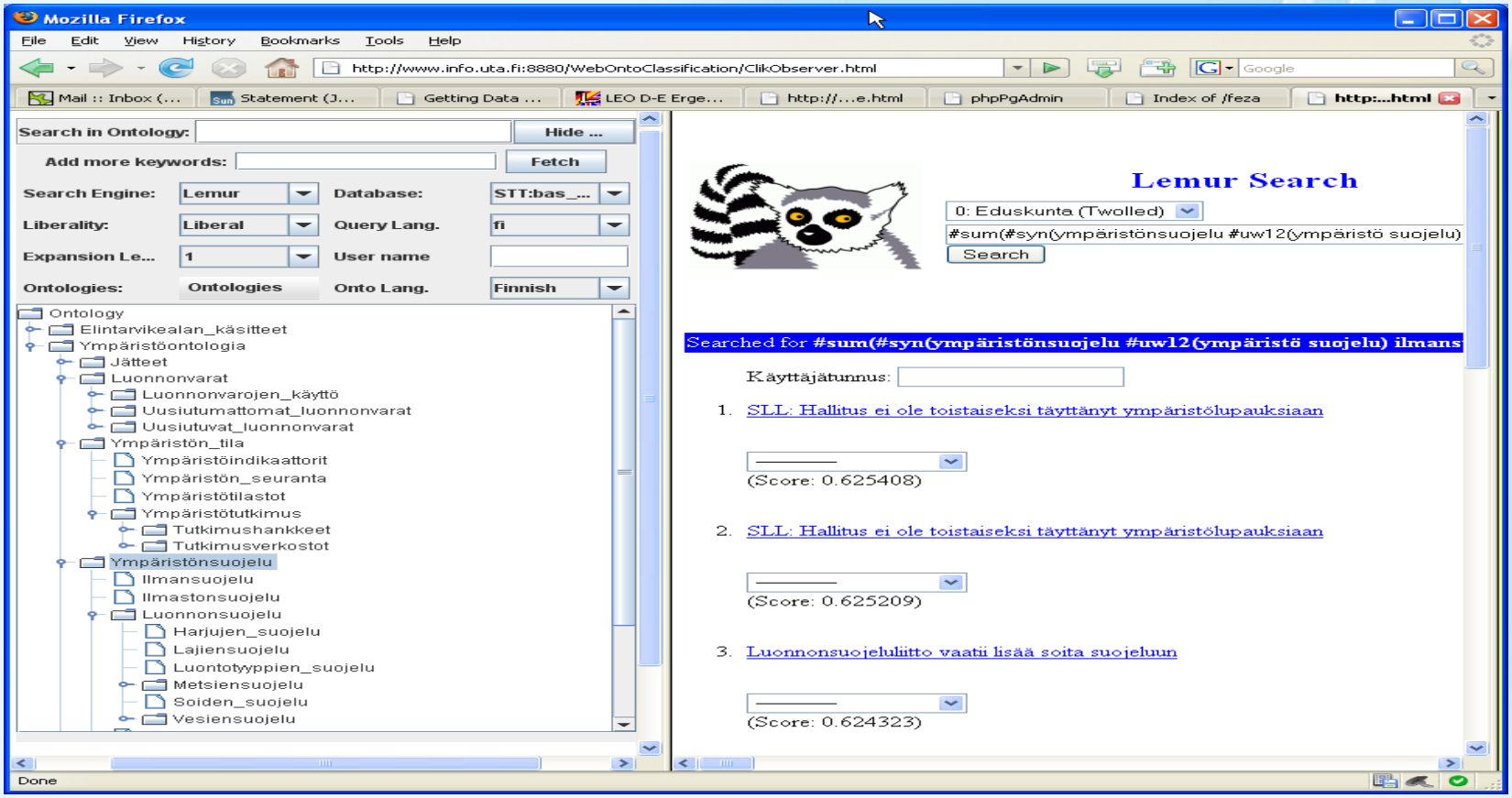
QUCCOO: Architecture



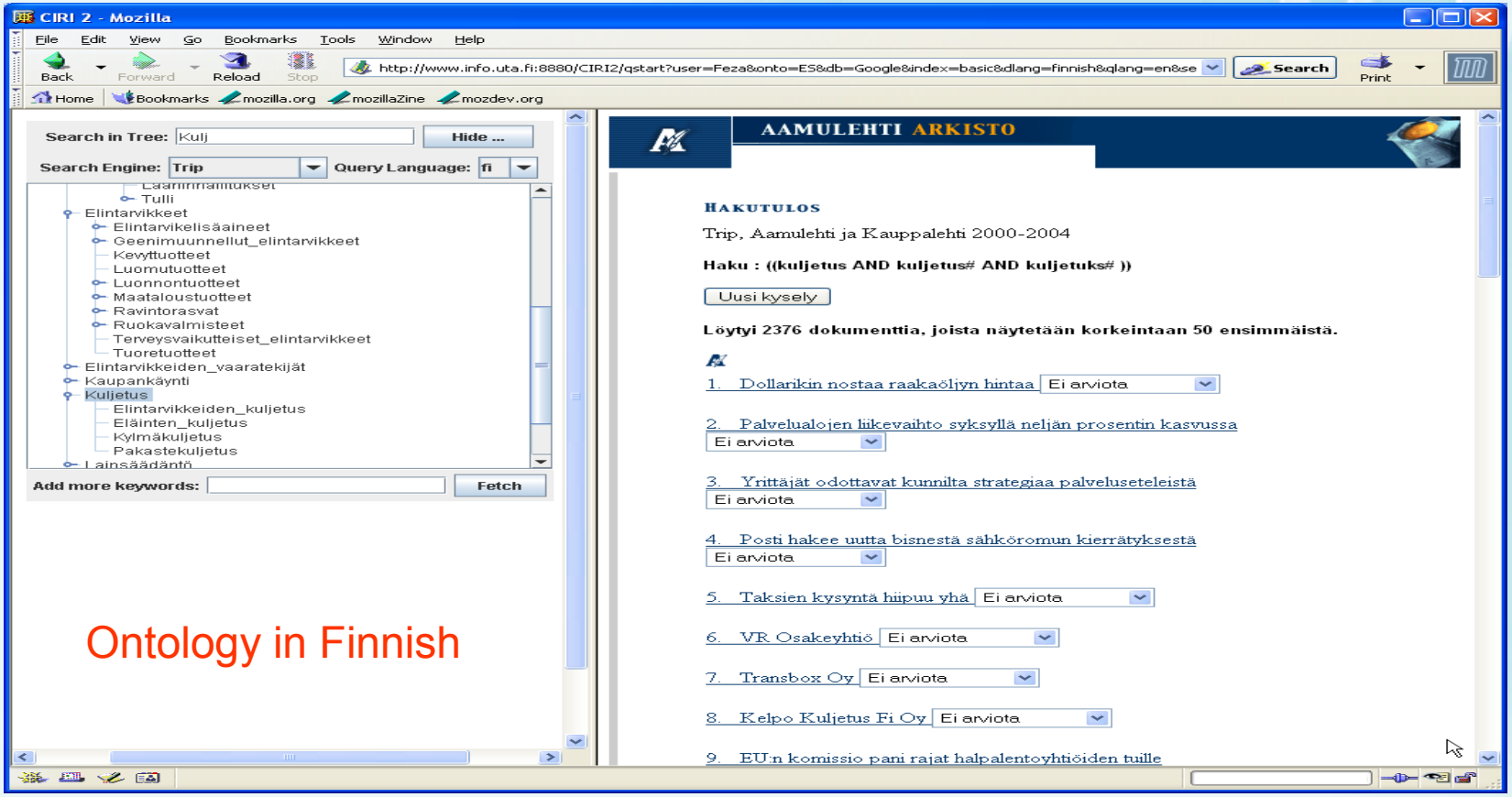
Quccoo - interface



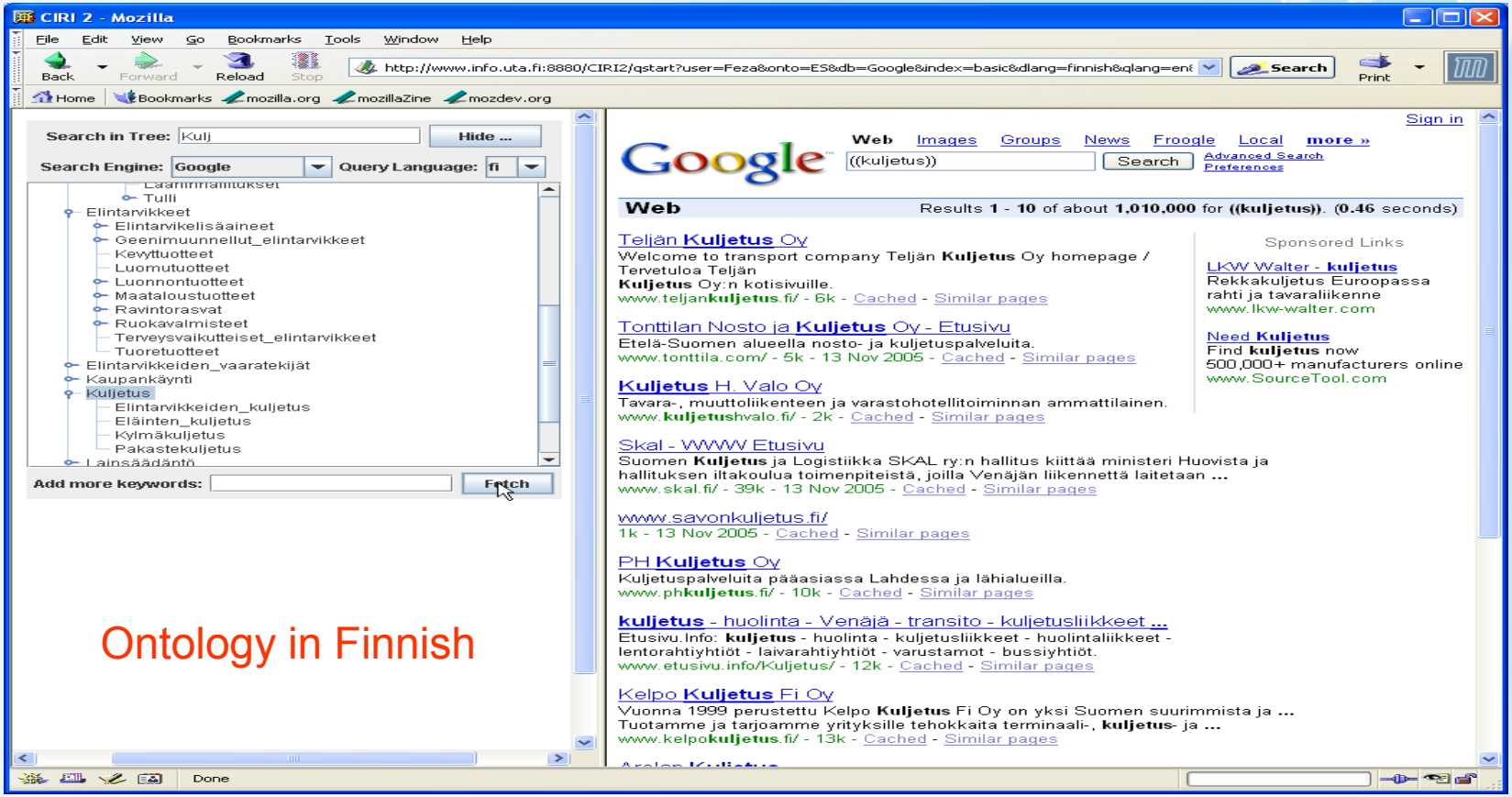
Quccoo - interface



Quccoo - interface

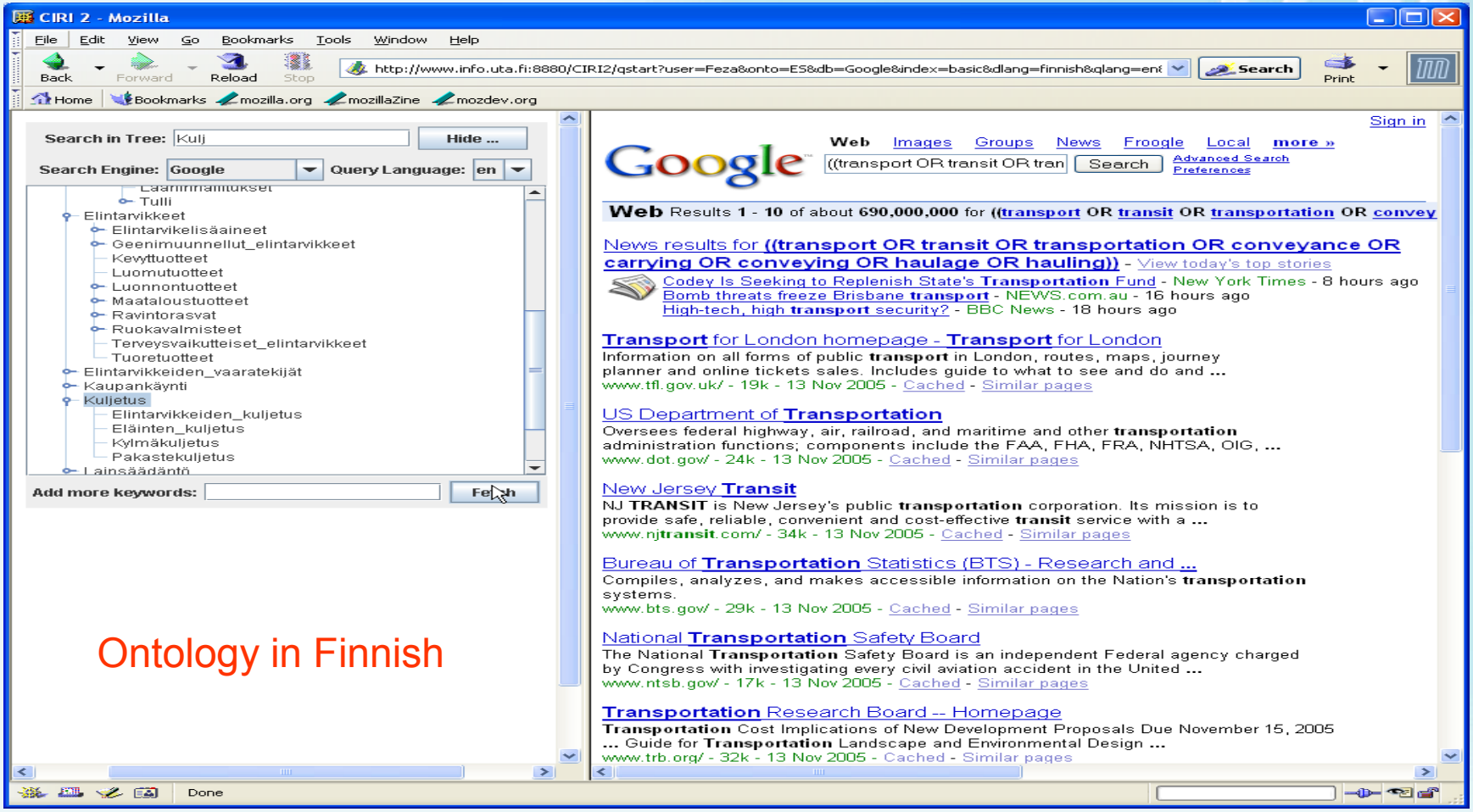


Quccoo - interface

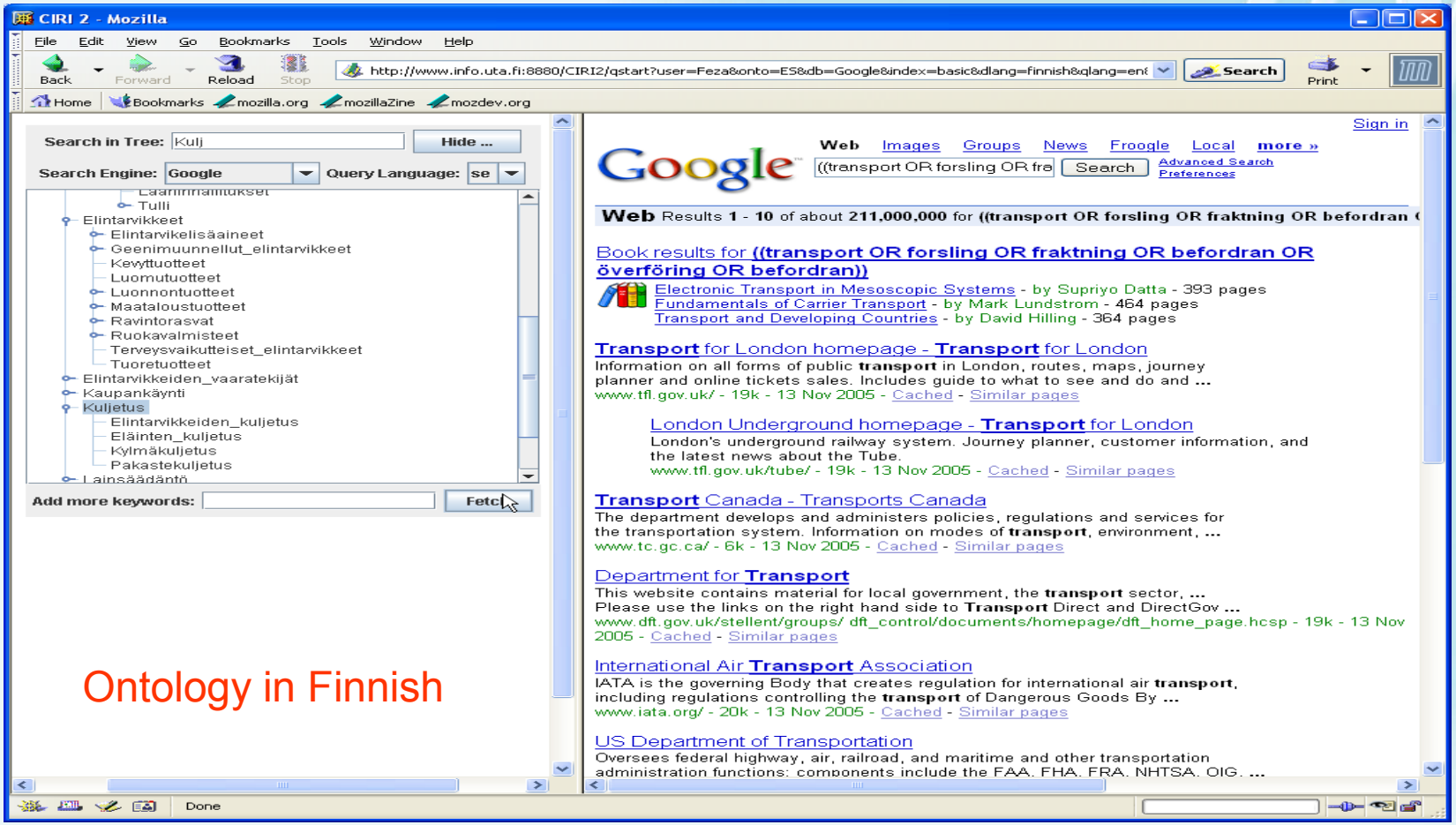


Google Results in Finnish

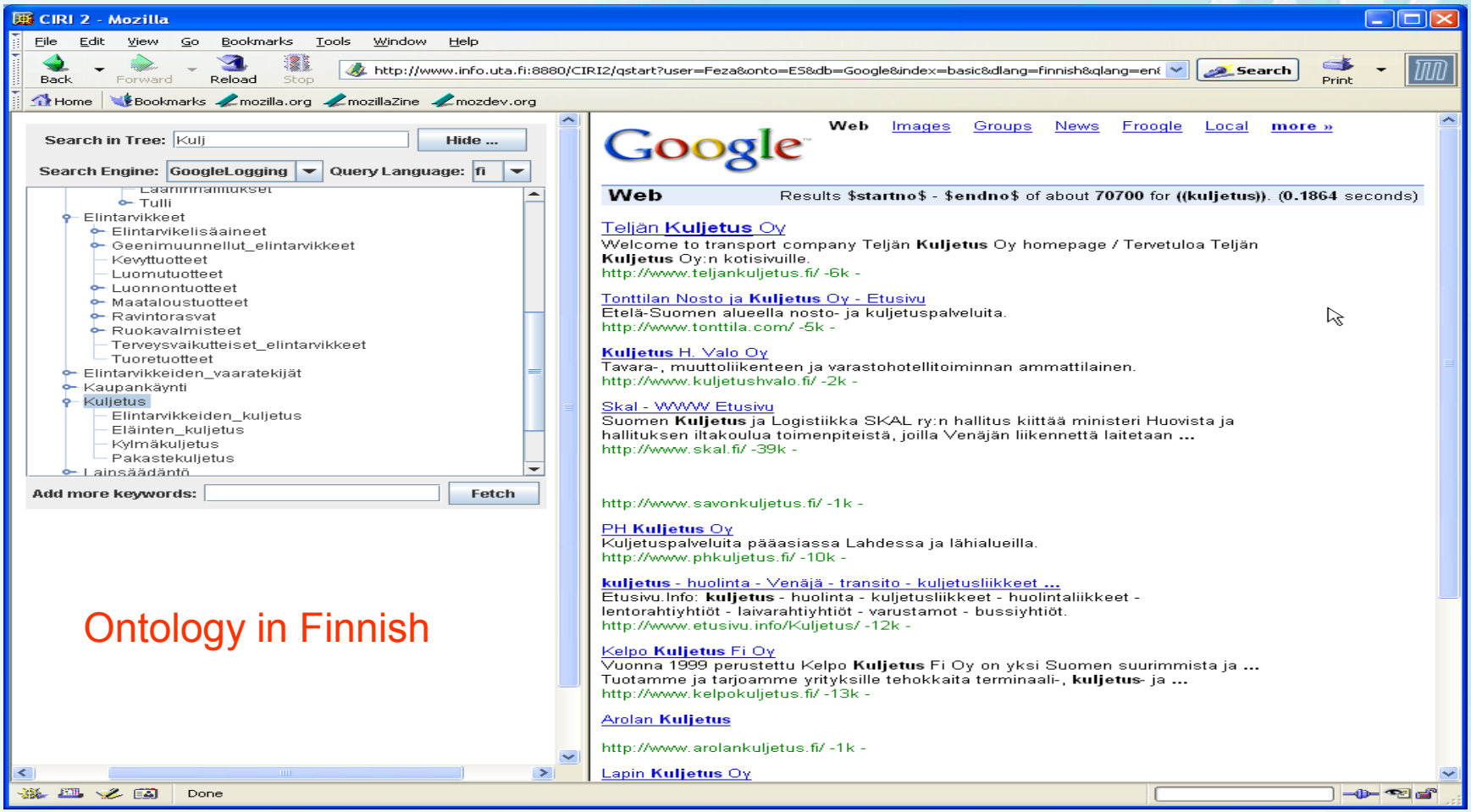
Quccoo - interface



Quccoo - interface



Quccoo - interface



Google Results with Logging Facility

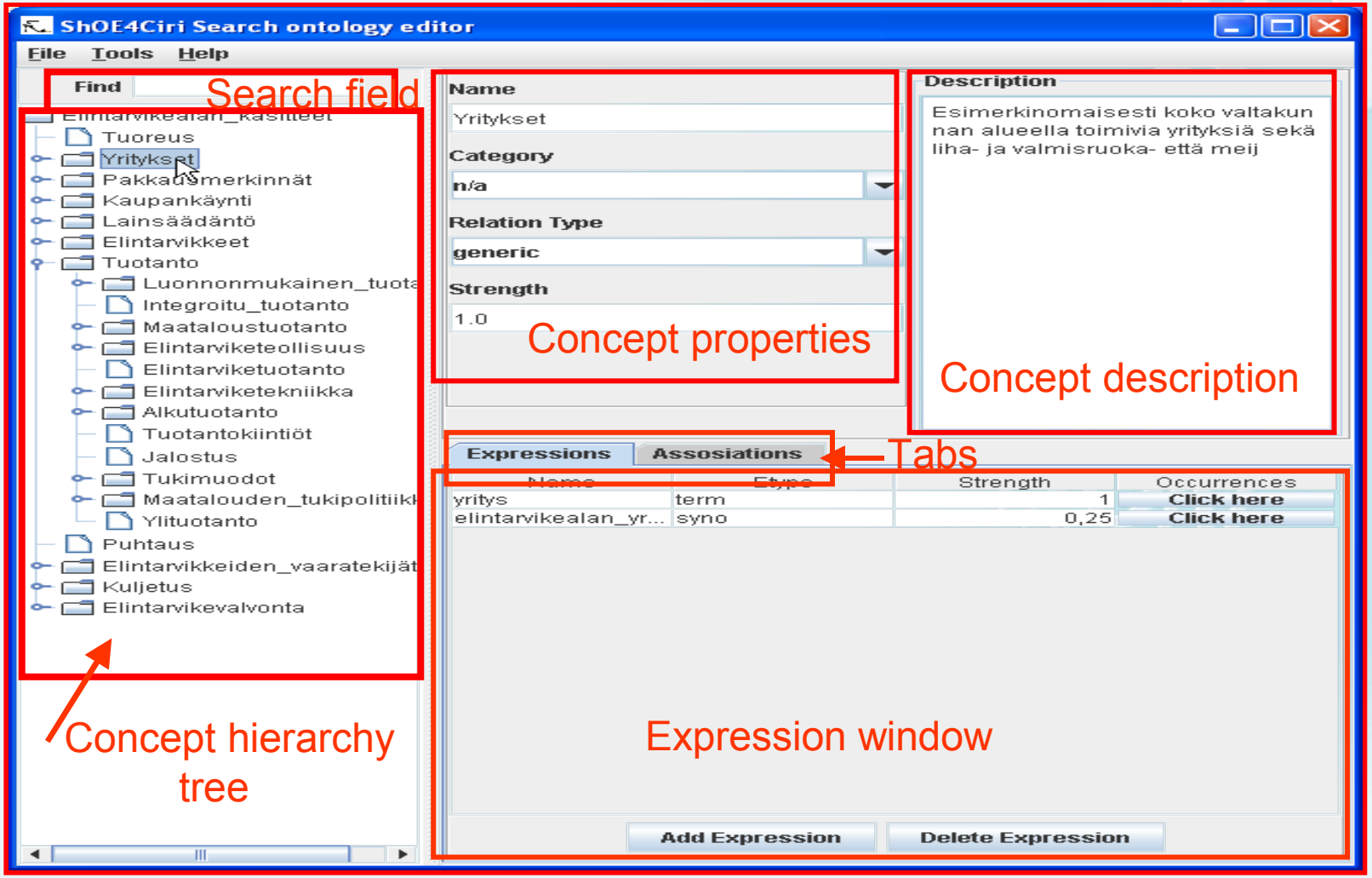
4. ShOE: Creating ontologies

- **Search Ontology Editor** - for creating ontologies
  - supports the 3 layer architecture of QUCCOO
  - intuitive; easy to learn and use
  - automatic support for the human editor
- Multilingual in many aspects
  - GUI, User Interface language can be changed
  - Concepts names can be edited/displayed on-the-fly in different languages
  - Expressions can be edited/displayed on-the-fly in different languages.

ShOE: Implementation

- Well-designed modular object-oriented architecture based on MVC paradigm
- Platform independent; written in Java
- Flexible; e.g. uses XML as file format, configurable tables, with XML configurable menu structure
- Robust
- Extensible via Plug-ins

ShOE - Main window



6. Conclusion

- ShOE and QUCCOO are *one* answer to problems in semantic information access
  - light-weight disposable search ontologies for full content access
  - independencies of:
    - ✓ collections (partially), indexing ways,
    - ✓ availability of metadata / annotations
    - ✓ changes of needs, variability of ”world models”
    - ✓ search engines, query languages
    - ✓ vocabulary variation and natural languages
  - a compromise, different from semantic annotation or indexing, with control at the user end

User testing

Cross-language Web search

- Test persons
  - 40 students from the University of Tampere and Pirkanmaa polytechnic
- Ontology
  - Combination of two ontologies: Food concepts and geographical concepts
- 2 interfaces
  - QUCCOO + interface without ontology (basic Google search)
- 4 simulated search tasks
  - Two tasks with one interface and two with the other

Analysis

- Log files
  - Queries
  - Relevance assessments (scale 0-4)
- Questionnaires
  - Opinions about ontology and Quccoo-interface

Results: search success

- No significant difference between systems
  - QUCCOO performed better when strong query structure was needed (“alcoholic beverage”)
  - In most self-formulated queries no phrases were used

  → QUCCOO helps persons who are not used to formulate structured queries

Results: opinions

- ”Structure of the ontology was logical”
- ”Finding search concepts needed in the tasks in ontology was easy”
- ”Using the ontology was effortless”
  - 92 % agreed in all

Results: opinions

- 32/40 thought that QUCCOO-interface was easier to use
- 32/40 liked QUCCOO better
- Why?
  - Helped users to clarify task topic and to find related search keys
  - Made cross-language search easy (in 80% of direct searches some dictionary was used to help query formulation)

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OntoClass
Ontology based Classification System
A tool for automatic document classification

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Ontoclass,Ontology based Classification System

Classify text documents

Standalone and web versions

Cross-language classification capability

Visual presentation of the classification results

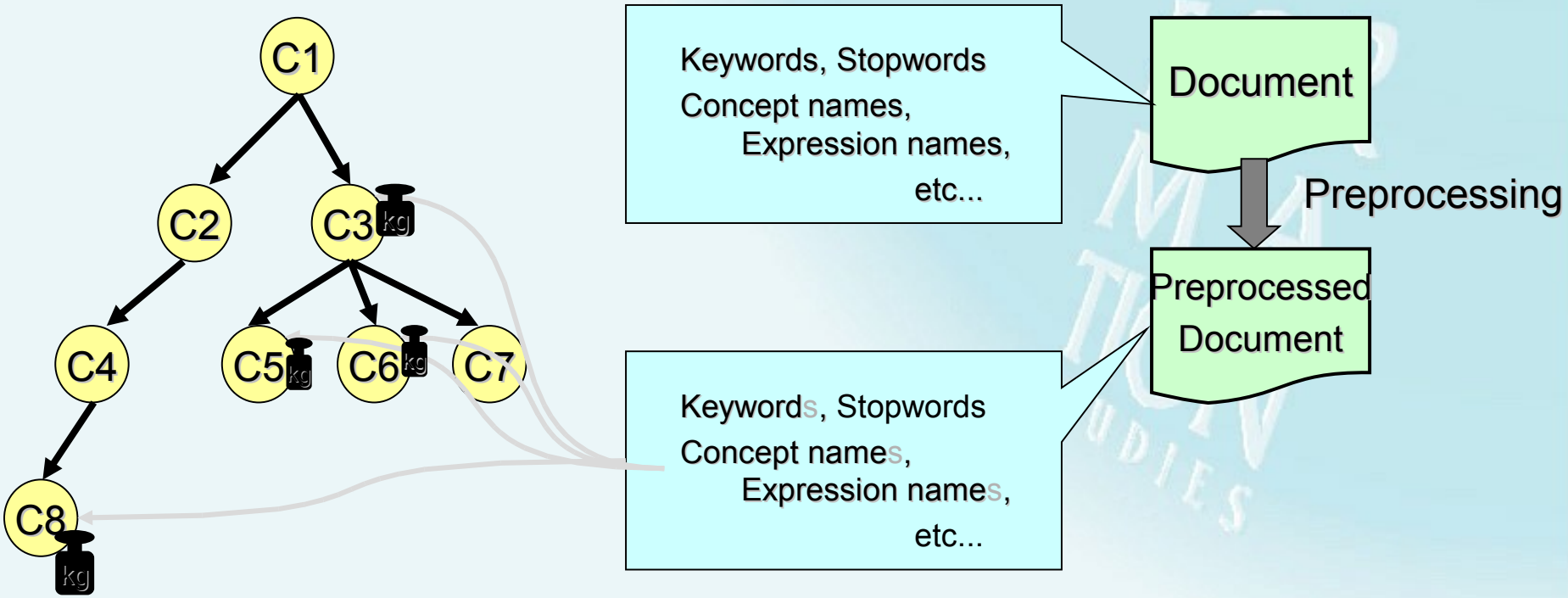
- easy to comprehend and easy to interpret
- based on the visual comprehension faculty of the user

Ontoclass,Ontology based Classification System

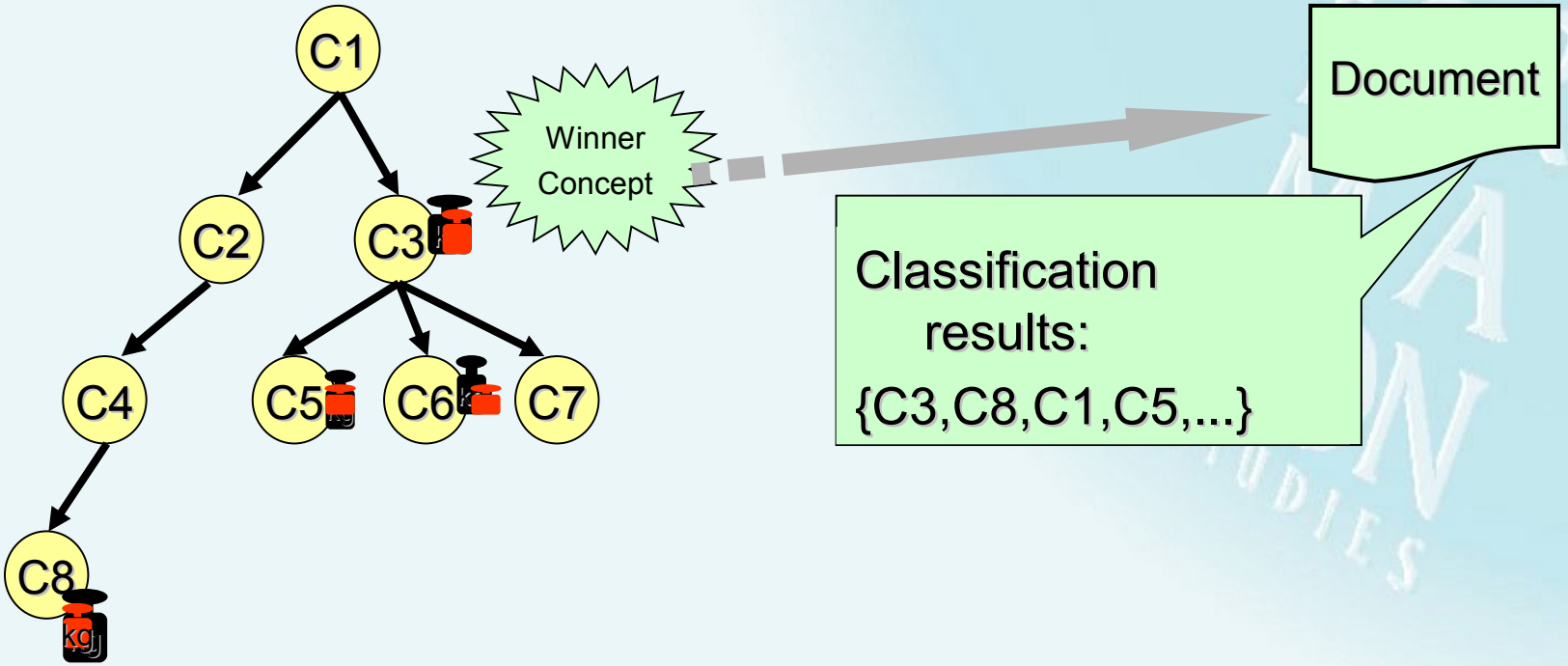
Consists of the following processes:

- Text preprocessing (lemmatizing stemming, etc.)
- Mapping the document to Ontology
- Weight propagation in ontology tree
- Selecting Winner concept(s)

Ontoclass, Ontology based Classification System

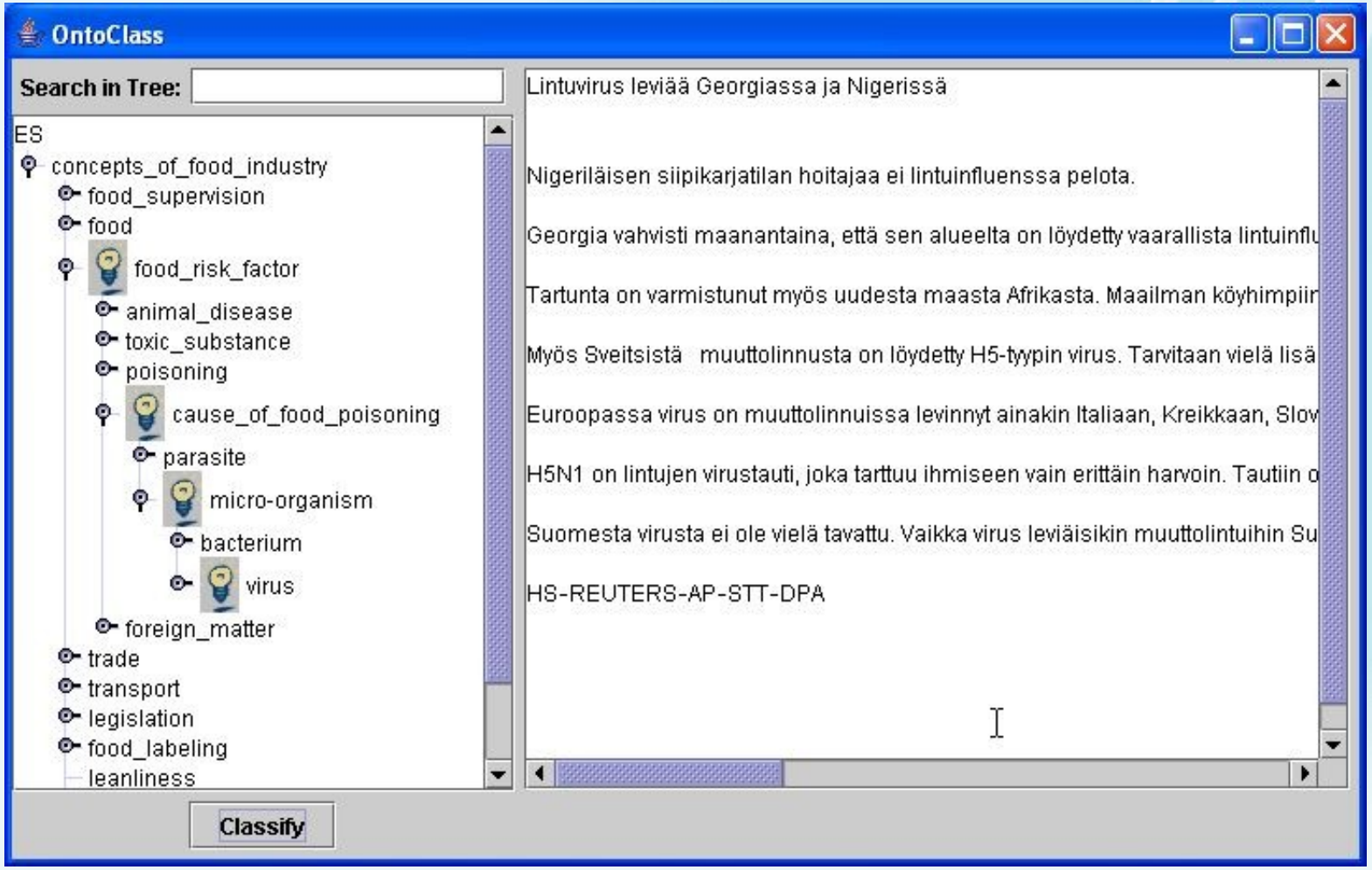


Ontoclass, Ontology based Classification System

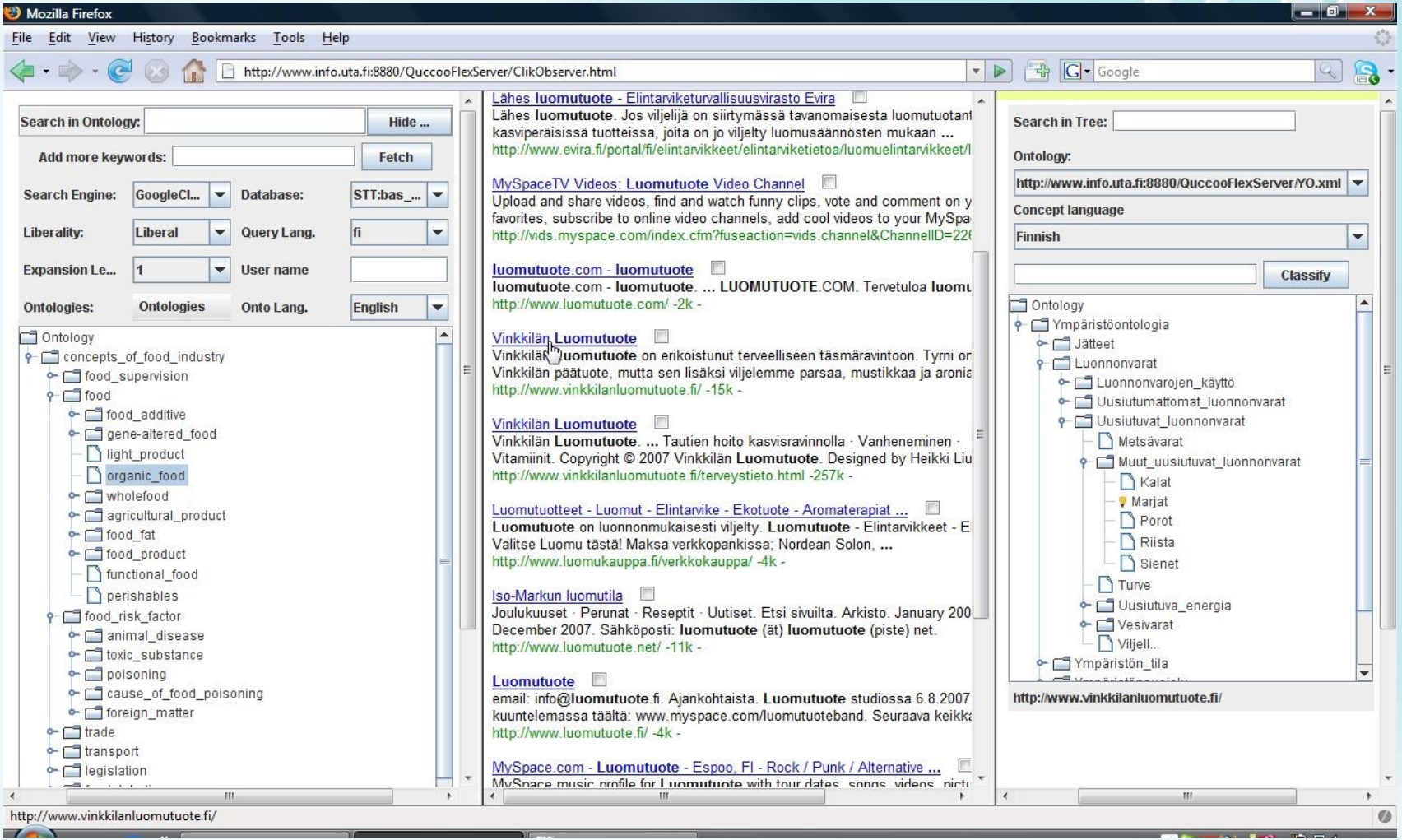


Weight propagation

OntoClass
User interface (Standalone version)



OntoClass (Web interface)



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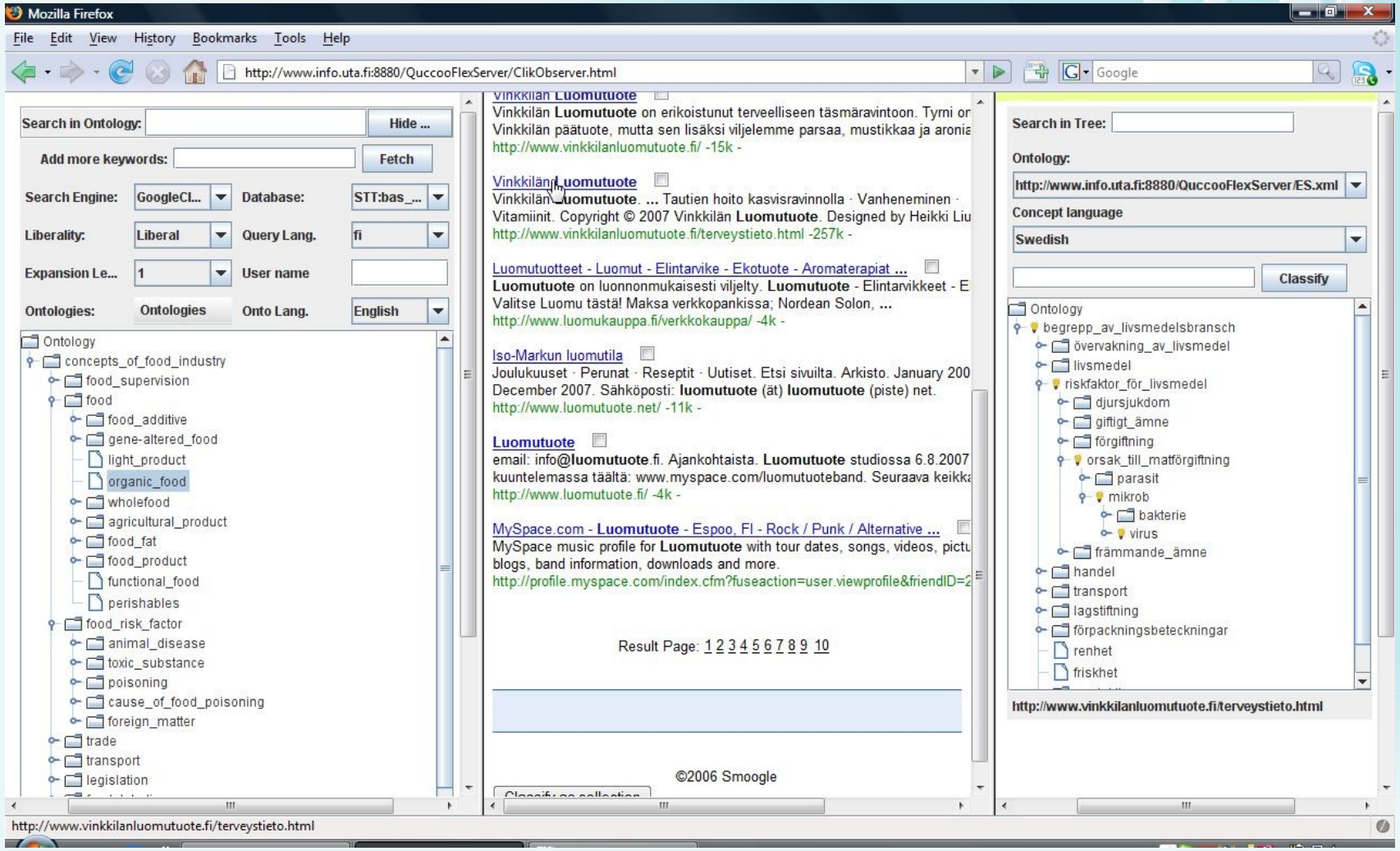

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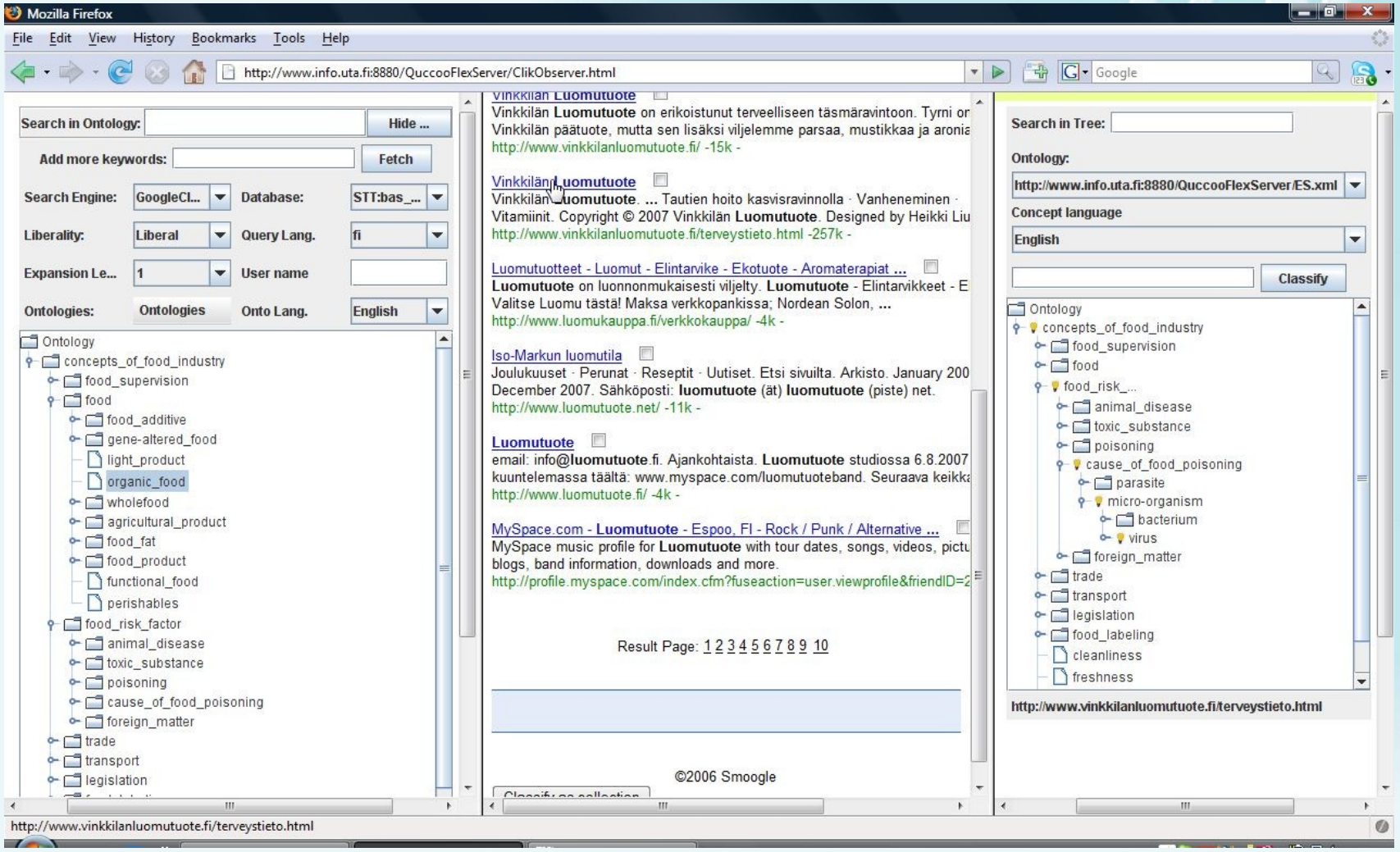

Discussion

Thank you!

Over to you ... questions?