EXPLOITING TAGGING IN ONTOLOGY-BASED E-LEARNING

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Overview

- Web 2.0 vs. Semantic Web
  - Different visions
  - Different approaches to knowledge organisation
- IWT: the Intelligent Web Teacher
  - Ontologies in IWT
  - Social Tagging in IWT
- How to integrate them
  - TagOntology + SCOT + MOAT
  - Advantages and open issues
Web 2.0 vs. Semantic Web

Web 2.0

- Enables the “Internet as a platform” vision
- Facilitates communication, information sharing, interoperability, and collaboration on the Web
- Main Applications:
  - blog, wiki, social networks, video-sharing, folksonomies
  
  *Web 2.0 applications exist only on the Internet, deriving their effectiveness from the inter-human connections and from the network effects that Web 2.0 makes possible, and growing in effectiveness in proportion as people make more use of them (Tim O’Reilly).*

- Main Features:
  - SLATES (Search, Links, Authoring, Tags, Extensions, Signals)
Semantic Web

- Enables the “Machine Understandable Web” vision.
- Allows developers to attach semantics to Web content and services.
- Facilitates the effective discovery, automation, integration, and reuse across various applications of Web content and services.
- Enabling Technologies:
  - XML, RDF, RDFS, OWL, SPARQL, Agents
- Applications and Projects:
  - DBPedia, Semantic MediaWiki, FOAF, MOAT

Different Approaches

- Web 2.0 and Semantic Web propose different approaches to knowledge organization:
  - Hierarchical Faceted Metadata
  - Folksonomies
  - Topic Maps
  - OWL (lite, DL, full)
- Each approach has advantages and disadvantages
- Some systems use several approaches but without integration
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Intelligent Web Teacher

- IWT is an e-Learning System
  - It exploits ontologies to provide intelligent learning functions
  - It exploits social tagging to support learning and to improve searches

www.momanet.it
Ontologies in IWT

- By exploiting ontologies, IWT is able to obtain intelligent functions like:
  - automatic evaluation of learner knowledge and learning preferences
  - automatic generation of individualised courses from learning goals, learner knowledge and preferences
  - automatic retrieval of related learning resources
- IWT ontologies are **defined by teachers** and composed of:
  - **concepts** representing learning topic
  - **relations** representing topic links
- Each available Learning Resource may be linked to one or more concepts of some system ontology

A Sample Ontology
A Sample Ontology

Ontologies in IWT

- An initial learning path is generated starting from a learning goal
- The generated learning path is then customised on the basis of the knowledge of each learner
- For each remaining concept IWT selects the best learning resources with respect to his learning preferences
Social Tagging in IWT

- In IWT learning resources can be tagged by any user
- The tagging process is free (no guidance for tags definition)
- The tagging process is used:
  - to improve the searching functionality (Tag Cloud)
  - to support collaborative learning activities (the teacher asks for the students to collaboratively categorize a set of resources)
- The result of the tagging process is a continuously growing folksonomy

Issues of the Current Approach

- IWT ontologies and the IWT folksonomy are independently managed
- This leads to:
  - redundancy of labels applied to content
  - disorientation for users
  - difficulty in sharing within the users community the intended meaning of tags
  - unnecessary complexity of the search engine
  - incapability to exploit tags within the course generation process
- Solution:
  - to integrate the two approaches… but how?
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Proposed Approach

- IWT ontology concepts (dictionaries) and tags are merged in a unified tag space
Proposed Approach

- With respect to the **Tag Ontology** conceptual model (by Richard Newman) each tag is represented by a triple:
  - **User** who created the tag (an IWT identifier or a FOAF description)
  - **Resource** tagged (an IWT identifier or an external URI)
  - **Tag** (a string)

- By applying the **MOAT** (Meaning Of A Tag) **Ontology** it is also possible to associate to a tag an unambiguous meaning
  - **Meaning** of a tag (URI of a Semantic Web resource like DBpedia, Geonames, etc.)

- By applying the **SCOT** (Social Semantic Cloud of Tags) **Ontology** it is also possible to manage several relations between tags.

Proposed Approach

- The tag space is populated and exploited:
  - by several users
  - through several processes
Main Processes

- **Insert**
  - a new tag is added to the tag space:
    - when new concepts are defined by ontology authors
    - every time an user tags a learning resource
    - when new tags used in the Blog, Wiki, Forum, etc.

- **Import/Export**
  - the adoption of the Tag, SCOT and MOAT ontologies ensure high interoperability with external tag spaces

- **Search**
  - keyword-based search and Tag Clouds are implemented

Main Processes

- **Suggest**
  - it is possible to support the users when they use tags e.g. suggestions about tags already existing in the tag space may be given:
    - by calculating the Google distance between the tags
    - by exploiting relations defined on tags

- **Organize**
  - it is possible to support users when building ontologies by providing draft structures automatically extracted from the tag space
    - by exploiting tag relations defined by users
    - by exploiting relations between semantic meanings of tags (MOAT)
Advantages of the Proposed Approach

- **The redundancy of labels is reduced**
  - unique tag space

- **The disorientation for users is reduced**
  - use of tags both as ontologies concepts and as keywords

- **The difficulty in sharing within the users community the intended meaning of tags is reduced**
  - adoption of Tag, MOAT and SCOT ontologies

Advantages of the Proposed Approach

- **The complexity of the search engine is reduced**
  - resources described only by tags
  - availability of advanced searches based on tag similarity

- **The incapability to exploit tags within the course generation process is reduced**
  - tags and ontology concepts have the same meaning
  - ontology relations may be extracted from the tag space
THANKS FOR YOUR ATTENTION

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