
Liana Razmerita,
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Content of defense presentation

1. Introduction
   - Context of research: Nimis, I3 project, KInCA a Xerox funded project, Ontologging, an IST, EC funded project;
   - What are the challenges of a next generation of KMSs?

2. Thesis statement
   - Research questions;

3. Related work

4. Thesis contributions
   - Ontology-based user modeling framework- OntobUMf

5. Conclusions
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3. **Related work**

4. **Thesis contributions**
   - Ontology-based user modeling framework- OntobUMf

5. **Conclusions**
Introduction

- Context of research: Ontologging project
  - A next generation of KMSs: ontologies, user modeling and agents.
- What are Knowledge Management Systems?
  - Information systems dedicated to manage organizational knowledge. [Leidner and Alavi, 2001]

KMSs aim to integrate complex knowledge processes:
- Collaboration between employees;
- Learning processes;
- Management of tacit knowledge;
- To better organize knowledge
- "Content is not correctly organized, not updated or duplicated."
- "These tools need major improvement to allow users use Knowledge tools in an easy way, spending few time and don't lose among hundreds of document", "save time when I am looking for a solution"
  - powerful mechanisms to filter relevant knowledge and advanced user support;
- "To know what people know and to make their experience with technology and products accessible."
  - to better manage the tacit knowledge;
- ontologies
  - semantic-based representations
  - metadata
- user modeling
  - characteristics, expertise
  - domains of interest
- agents
  - distributed processing
Content of defense presentation

1. Introduction
   - Context of research: Ontologging, an IST, EC funded project;

2. Thesis statement
   - Research questions;

3. State of the art

4. Thesis contributions
   - Ontology-based user modeling framework- OntobUMf

5. Conclusions

Thesis statement

- Knowledge workers are the key element for the management of the tacit knowledge;
- growing interest in better managing the tacit knowledge;
- User model and user modeling can contribute to enhanced/advanced functionalities of KMS
  - users are different and they have different specific needs;
  - alleviate information overload problem;
  - support for collaboration and learning processes;
- An ontology-based user modeling approach is beneficial not only in the context of an ontology-based KMS.
  - reusable user models implemented using Semantic Web technology.
Research questions

- Why is it important to model users of a KMS?
  - What are the relevant characteristics of the users of a KMS?
  - What type of user’s behavior can be distinguished in a KMS?
  - How to track and maintain the user models in a KMS?
- How can a user model improve the interaction with a KMS?
  - What type of intelligent /personalized services can be provided based on the user’s characteristics?
- What are the advantages/limitations of applying ontologies in user modeling?
- What are the perspectives of its use in the context of the Semantic Web?

Related work

- User modeling research
  - Reusable user models Kay [1999; 2001]
- Ontology research
  - Ontology, agents and corporate memory: FRODO [Van Elst & Abecker, 2001], CoMMA [Gandon and Dieng-Kuntz, 2001]
  - Ontology based personalization: EPOS [Schwarz and Roth-Berghofer, 2002], Elena [Dolog et. al., 2003];
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What are ontologies?

- “Ontology is a specification of a conceptualization” [Gruber, 1993]
- “The subject of ontologies is the study of the categories that exist or may exist in some domain.” [Sowa, 2000]
- “Representation vocabulary typically specialized to some domain or subject matter.” [Chandrasekaran et al., 1998]
- “Sort of world view with respect to a given domain” [Uschold and Gruninger, 1996]
What are ontologies?

**Definition**

An ontology structure $O := \{C, R, H^C, r, A^O\}$ consisting of:

- $C$ – concepts, $R$ – relations.

  $C \cap R = \emptyset$

- $H^C$ - a concept hierarchy or taxonomy.

  $H^C \subseteq C \times C$

  Example: $H^C(C_1, C_2)$, $C_1$ is a sub concept of $C_2$.

- $r$: non-taxonomical relations defined between concepts.

  $r: R \rightarrow C \times C$

  dom: $R \rightarrow C$ with $\text{dom}(R) := \Pi_1(\text{rel}(R))$, domain of $R$.

  range: $R \rightarrow C$ with $\text{range}(R) := \Pi_2(\text{rel}(R))$.

- $A^O$: set of axioms.

How can an ontology be formalized?

- **Ontology languages**

- **Web ontology languages**
  - XML is a W3C standards for structuring data and documents
  - RDF/RDFS are W3C standards for representing information and metadata on the web
  - KAON, DAML+OIL, OWL are related to the Semantic Web initiative
User modeling using Resource Description Framework (Schema)

User ontology building

Methodology developed by [Uschold and Gruninger, 1996]

Step 1 Specification phase
- Extends IMS LIP-upper ontology

Step 2 The process of coding
- KAON comprises a set of tools for ontology management and an ontology API for developing ontology-based applications
- Web ontology language extending RDF/RDFS
- OWL was not available

Step 3 The process of integrating with existing ontologies
- The definition of similar concepts as synonyms
- Different representation languages
Ontology-based user modeling framework (OntobUMf)

User Model

User Profile Editor

Manually provided

Intelligent Service 1

Automatically provided

Intelligent Service n

User Ontology

User Instances

Domain Ontology

Domain Instances

Documents

Log Ontology

Log Instances

User Model

Ontology-based user modeling framework (OntobUMf)

Ontologing User Profile Editor - Microsoft Internet Explorer

Welcome, Liana

Profile:

- Identification
- Affiliation
- OCL
- Competency
- Activity
- Accessibility
- Interest
- Goal
- Behaviour

Documents

ontologies in use

Ontology-based user model

Liana activity

- documents: add a value
- projects: add a value
- working papers: add a value
- white papers: add a value
- reports: add a value

Cardinality: 0 ... e

Cardinality: 0 ... e

Cardinality: 0 ... e

Cardinality: 0 ... e

Cardinality: 0 ... e

Cardinality: 0 ... e

Cardinality: 0 ... e

Cardinality: 0 ... e

Cardinality: 0 ... e

Cardinality: 0 ... e

Cardinality: 0 ... e

Liana Razmerita
Intelligent service Category Extractor

Category extractor –extracting characteristics of users

- Categories of users obtained by processing the logs (heuristics + fuzzy logic);
  - **Type of Activity**: Readers/ Writers/ Lurkers;
    - If \(\text{nb\_of\_read\_papers} > \text{NR}\) and \(\text{nb\_of\_contributions} < \text{NC}\)
      then user(x) = "reader" (during timeframe)
    - If \(\text{nb\_of\_contributions} \geq \text{NC}\) then user(x) = "writer" (during timeframe)
    ....
  - **Level of Activity**: Very Active/Active/Visitor/Inactive;
    - If \(\text{nb\_of\_read\_papers} > \text{NR}\) and \(\text{nb\_of\_contributions} \geq \text{NC+1}\)
      then user(x) = "very active"
    ....
    - If \(\text{nb\_of\_read\_papers} = 0\) and \(\text{nb\_of\_contributions} = 0\)
      Then user(x) = "inactive" (during timeframe)
Category extractor – extracting characteristics of users

Level of Knowledge Sharing:

\[ Y = f(x_1, x_2) \text{-- [very high, high, medium, low, very low]} \]

\[ x_1 \text{ the type of activity: [high, medium, low]} \]

\[ x_2 \text{ the level of activity: [high, medium, low, very low]} \]

<table>
<thead>
<tr>
<th>( Y = f(x_1, x_2) )</th>
<th>high</th>
<th>medium</th>
<th>low</th>
<th>very low</th>
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<tr>
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<td>low</td>
<td>high</td>
<td>very low</td>
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</tbody>
</table>

The calculus of the level of knowledge sharing
KInCA - Story telling agents

Ontology-based user modeling-expertise modeling application scenario

(User, works_on, Project)
(Project, related_to, Topic)

(Liana, works_on, Ontologging)
(Ontologging, related_to, Knowledge Management)
(Ontologging, related_to, Ontology)
(Ontologging, related_to, User modeling)

FORALL Y,Z <- Y:User [works_on ->>Z] and Z: Project [related_to->>topics]
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5. Conclusions, evaluation results and future work

Conclusions

- User ontology extending IMS LIP package
- Ontology-based user modeling
  - Traditional knowledge representation mechanisms for user models are: semantic networks, conceptual graphs, object
  - Ontology facilitates knowledge sharing and building reusable user model
  - Metadata can be used to infer characteristics of the knowledge workers: (e.g. the expertise of the user, the activity etc.)
Evaluation results and conclusions

- OntobUMf- CE models the Behavior of the users
  - the level of knowledge sharing;
  - the type of activity;
  - the level of activity;

- Recognition and promotion are key incentive for knowledge sharing for the Indra knowledge workers;

- Certain users are concerned with privacy and trust issues
  - User’s profile should be only partial available in a KMS;
  - Users want to be in control and to maintain their profiles;
  - The use of combo box would facilitate the acquisition of the user’s data and the consistency of the terminology;

Evaluation results and conclusions

- Personalization is an important issue due to “information overload” problem and heterogeneity of the users
  - Adaptation of content (templates), notifications through knowledge distribution agents

- Expertise modeling is important element for KMS
  - User modeling a better management of the tacit knowledge
  - User modeling techniques can be employed to maintain characteristics of the users
Future work

- Privacy issues but it opens perspectives related to personalization, collaboration, learning, etc. all around the web
- Extension of the user ontology
- An extended e-learning scenario
- An ubiquitous computing scenario