Ontology-Management Tasks and Protégé

- Maintain libraries of ontologies
- Import and reuse ontologies
- Translate ontologies from one formalism to another
- Provide support for ontology versioning

Different back ends

Provide support for ontology versioning

Project inclusion mechanism
**Ontology-Management Tasks (II)**

Specify **transformation rules** for instance data

Merge ontologies

Align and map ontologies

Extract self-contained parts of an ontology
The PROMPT suite of tools

- Merging
- Alignment
- Versioning
- Extraction
- Re-organization
General Problem: Ontology Matching

- Compare ontologies
- Find similarities and differences
  - Merging: similarities
  - Mapping: similarities
  - Versioning: differences
PROMPT: An Interactive Ontology-Merging Tool

- **PROMPT is:**
  - Partial automation
  - Algorithms based on
    - concept-representation structure
    - relations between concepts
    - user’s actions

- **PROMPT is not:**
  - Complete automation
  - Algorithm for matching concept names
The PROMPT Algorithm

1. Make initial suggestions
2. Select the next operation
   - Perform automatic updates
   - Find conflicts
   - Make suggestions
### To Do list

<table>
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<tr>
<th>Name</th>
<th>Arg1</th>
<th>Arg2</th>
<th>Params</th>
</tr>
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<tbody>
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<td>merge</td>
<td>Check air</td>
<td>Check car</td>
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<tr>
<td>merge</td>
<td>Credit_card</td>
<td>Credit_card</td>
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<tr>
<td>merge</td>
<td>Reservation_record</td>
<td>Reservation car</td>
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<tr>
<td>copy</td>
<td>Payment_information</td>
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### Reason for selected suggestion

frames have identical names
Record air is a subclass of Reservation_record-air
Generating Paths in the Graph

Design-a-Trial, S.Modgil, et.al.; CMT, I.Sim et.al.
Similarity Score

- Generate a set of all paths (of length < L)
- Generate a set of all possible pairs of paths of equal length
- For each pair of paths and for each pair of nodes in the identical positions in the paths, increment the similarity score
- Combine the similarity score for all the paths
Anchor-PROMPT: Initial Results

- TRIAL Trial
- PERSON Person
- CROSSOVER Crossover

Crossover

PROTOCOL Design
TRIAL-SUBJECT Person
INVESTIGATORS Person
POPULATION Action_Spec
PERSON Character
TREATMENT-POPULATION Crossover_arm
Ontology Versioning

- Ontology development became a dynamic, collaborative process
  - Need to maintain different versions
- CVS-type systems
  - Repository of versions
  - Check-in/check-out mechanisms
  - Version comparison (diff)
Structural Diff

Version 1

Wine
maker Winery
color String

White wine

Red wine

Merlot

Chianti

Version 2

Wine
produced_by Winery

White wine

Red wine
tannin String

Merlot

Chianti

Rosé wine
Structural Diff (II)

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<thead>
<tr>
<th>f1</th>
<th>f2</th>
<th>renamed</th>
<th>operation</th>
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<td>color</td>
<td>tannin level</td>
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<td>Add</td>
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<td>Blush wine</td>
<td>Rosé wine</td>
<td>Yes</td>
<td>Isomorphic</td>
</tr>
<tr>
<td>maker</td>
<td>produced_by</td>
<td>Yes</td>
<td>Isomorphic</td>
</tr>
<tr>
<td>Chianti</td>
<td>Chianti</td>
<td>No</td>
<td>Isomorphic</td>
</tr>
<tr>
<td>Merlot</td>
<td>Merlot</td>
<td>No</td>
<td>Changed</td>
</tr>
<tr>
<td>Red wine</td>
<td>Red wine</td>
<td>No</td>
<td>Changed</td>
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<tr>
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<td>White wine</td>
<td>No</td>
<td>Changed</td>
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<tr>
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<td>Wine</td>
<td>No</td>
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<tr>
<td>Winery</td>
<td>Winery</td>
<td>No</td>
<td>Unchanged</td>
</tr>
</tbody>
</table>

Diagram:
- **Wine**
  - **color** String
  - **produced_by** Winery
- **White wine**
  - **tannin** String
  - **produced_by** Winery
- **Blush wine**
  - **color** String
  - **produced_by** Winery
- **Red wine**
  - **produced_by** Winery
  - **color** String
Ontology Versioning versus Ontology Alignment

- Compare different ontologies versus compare different versions of the same ontology
- Ontology versioning: if things look similar, they probably are
- A large fraction of ontologies remains unchanged from version to version
**PrompDiff Algorithm**

- Consists of two parts
  1. A set of heuristic matchers
  2. A fixed-point algorithm to combine the results of the matchers
- Can be extended with any number of matchers
Single Unmatched Sibling

Wine
  maker Winery
color String

White wine
  Blush wine
  Red wine
    Merlot
    Chianti

Wine
  produced_by Winery

White wine
  Rosé wine
  Red wine
    tannin String
    Merlot
    Chianti
Evaluation results

- All frames that OntoDiff matched, it matched correctly
- Recall: 95%
- Precision: 91%
Visualizing changes

Joint work with Michel Klein
Visualizing changes (II)

The PROMPT suite of tools
Interaction among the PROMPT tools
Create a self-contained sub-ontology

- Extract all the information about esophagus from the anatomy ontology

- Ensure that all the necessary concepts are defined in the sub-ontology

- Specify the depth of the transitive closure of relations
Included and including projects

- Move frames between included and including projects
- Ensure that no frames from the included projects reference frames in the including project
Future directions

- Ontology mapping and merging
  - Use explicit mappings to merge ontologies
  - “Eavesdrop” during interactive merging to create explicit mappings
- Ontology versioning and mapping
  - Update mappings when ontology changes
- Ontology mapping
  - Introduce uncertainty
  - Find complex mappings