Is Our Merging Right?  
Towards More Reliable Merging Decision

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This Project is About

Version Control
Model Merge
Provenance Information
Model Management
Summarization
Visualization
Conflict Resolution
Development is Collaborative
Version Control System (VCS)

CVS, SVN, Git, Mercurial, Dropbox(!), etc.

• Keeps multiple (older and newer) versions of everything (not just source code).

• Requests comments regarding every change.

• Typically synchronize through “check in” and “check out”.

• Displays differences between versions.
Collaboration on Different Parts
Collaboration on Different Parts
Model Version Control Systems

- AMOR.
- EMF Store.
- IBM Rational Software Architect (Based on Jazz).
- CDO
Collaboration on Same Part
Conflict Resolution

Model Versions

<table>
<thead>
<tr>
<th>Original Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revised Model 1</td>
</tr>
<tr>
<td>Revised Model 2</td>
</tr>
</tbody>
</table>

Merge Process

| Change Detection |
| Conflict Detection & Tentative Merge |
| Conflict Resolution |

Tentatively Merged Model with Conflict Annotations

Final Merged Model
Conflict Resolution

Model Versions

- Original Model
- Revised Model 1
- Revised Model 2

Merge Process

- Change Detection
- Conflict Detection & Tentative Merge

Tentatively Merged Model with Conflict Annotations

Conflict Resolution

Final Merged Model

Manual
Quick Quiz

What will be the merge model?
Quick Quiz

Is this the merged model?
Quick Quiz

Option One

Option Two
Are we sure?
If we are lucky
Otherwise..

Search answer for:

- why this changes has been done?
- How the model evolved to this point?
Otherwise..

Search answer for:

- why this changes has been done?
- How the model evolved to this point?

Current Model VCS answer the questions like:

- Who made this change and when?
- Where the change had been made?
Model Provenance Information

The 7 W’s
Model Provenance Information Semantics

*Element can be any modeling element.*
A Proposed Framework

Architecture
Prototype

Summarization

• Open Text Summarizer (multiple contributor),
• MEAD (University of Michigan),
• SweSum (kth, sweden),
• FociSum (CS, Columbia),
• SUMMARIST(ISI, Southern California).
Prototype

Summarization

MEAD: Most comprehensive

Keyword based feature
A keyword feature script can be found in $BIN DIR/feature-scripts/keyword/QueryPhraseMatch.pl. This new feature script assigns weights to sentences according to keywords and regular expressions it contains. Meaning that this feature may be used for boosting up the score of the sentences that have critical importance for the user. For example, the user may want to include all the sentences that contain the name of a specific person in the summary. One should be careful to note that the regular expressions provided should be PERL regular expressions. The keywords and regular expressions are specified by the user in a query file in which the script looks for the "KEYWORDS" tag.

Summary
A keyword feature script can be found in $BIN DIR/feature-scripts/keyword/QueryPhraseMatch.pl.
Prototype
Visualization (Mock Up)

<table>
<thead>
<tr>
<th>Who</th>
<th>When</th>
<th>Why</th>
<th>How</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bob</td>
<td>10 Dec. 2012</td>
<td>Msg: Change requirement in Task 107. <strong>Summary:</strong> Due to underutilization of resources, we need to outsource our transformation service.</td>
<td>Deleted element (MID: 12, name='driver'), Deleted element (MID: 12, name='has'), Added element (MID: 35, name='Transport Service Vendor'), etc.</td>
</tr>
</tbody>
</table>
Prototype Visualization (Mock Up)
Quiz Returns

Option One

Company
- name

Transport Service Vendor

Employee
- ID
- Age

Driver
Admin Staff

Vehicle
- RegNo

Truck
Car

Option Two

Company
- name

Transport Service Vendor

Employee
- RegNo

Driver
Admin Staff

Vehicle
- ID
- Age

Truck
Car
Evaluation

- We think that this approach will be useful, no scientific evaluation yet.

- We have plan to conduct a online survey.

- Measure the time required, Precision, and Recall.
Contribution

- Investigate and analyse the state of the art model versioning tools and identify a need which is not fulfilled by the current model/code versioning tools.

- Outline a model of provenance semantic for Model versioning.

- Propose a framework which can potentially fulfill the need.
Future Work

- Finish implementation.
- Conduct an evaluation
- Incorporate pro-active conflict resolution.
A Look at History

40 years ago
“The system shall do this, that, and the other thing”

Today
“The system shall do this, that, and the other thing”

How do we shorten the “arrow of pain” further?

*Slide: Course lecture from Marsha.
Reference

- www.cvshome.org
- Slide of Marsha @ First Class
- Numerous image from web (Shamelessly copied)