MDSheet: A Framework for Model-driven Spreadsheet Engineering

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Why do Spreadsheets matter?

Omnipresent
Easy-to-use
Multi-purpose
Flexible

95% of all U.S. firms
90% of all analysts in industry
50% of all SSs are the basis for decisions
Economy losses of $10 billion/year!

http://www.eusprig.org/stories.htm
The Contribution of Models
Models in Spreadsheet Applications

ClassSheets: automatic generation of spreadsheet applications from object-oriented specifications, Gregor Engels, Martin Erwig, ASE'05
MD Spreadsheet Engineering in MDSheet

I. Embedding ClassSheets in Spreadsheet

II. Co-evolution of Models and Instances

III. ClassSheet Model Inference
I. Embedding ClassSheets in SpreadSheets

Powerful interactive interface
Single Environment for SS evolution
Model-instance synchronization

Syntactic restrictions

Embedding and Evolution of Spreadsheet Models in Spreadsheet Systems, Jácime Cunha, Jorge Mendes, João Paulo Fernandes, João Saraiva, VL/HCC'11
II. Co-evolution of Models and Instances

<table>
<thead>
<tr>
<th>Semantic Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block ≤ Block \ Block</td>
</tr>
<tr>
<td>Block ≤ Block^ Block</td>
</tr>
<tr>
<td>Sheet ≤ Sheet \ Sheet</td>
</tr>
<tr>
<td>Class ≤ Class^ Class</td>
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<tr>
<td>Sheet ≤ Sheet \ Class</td>
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<tr>
<td>Block ≤ Block \ Block</td>
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<tr>
<td>Label : Class ≤ Label : Class \</td>
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<tr>
<td>Class ≤ Class^</td>
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<tr>
<td>Sheet ≤ (Sheet \ Sheet)_{ref}</td>
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<td>Sheet ≤ (Sheet \ Sheet)_{ref}</td>
</tr>
</tbody>
</table>

Data-refinement theory

Model transformations (type-level) \leftrightarrow Data transformations (value-level)

Type-safe Evolution of Spreadsheets, Jácome Cunha, Joost Visser, Tiago Alves, João Saraiva, FASE'11
III. ClassSheet Model Inference

Database Normalization Theory

Automatically Inferring ClassSheet Models from Spreadsheets, Jácome Cunha, Martin Erwig, João Saraiva, VL/HCC'10
MDSheet

- Available at http://ssaapp.di.uminho.pt

- Built out of ~7500 LOC:
  - 3695 in Haskell, for the Evolution and Inference
  - 871 in Basic, for the Embedding
  - 2800 in C++, for gluing all components