Progress and Challenges in Model-Driven Software Evolution
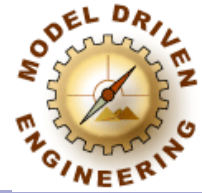
Tom Mens

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UMH

Fourth International ERCIM Workshop on Software Evolution (EVOL 2008)

- 15-16 September 2008
- L'Aquila, Italy
- Co-located with ASE 2008
- Organised by ERCIM Working Group on Software Evolution

- Papers and tool demonstrations solicited
  - on all aspects of software evolution
  - submission deadline: 16 June 2008

Commercial break

Website

http://evol08.inria.fr/

European Research Consortium
for Informatics and Mathematics

ERCIM
www.ercim.org

MODELS 2008 workshop on
Challenges in Model-Driven Software Engineering
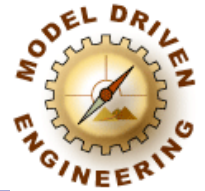
Toulouse, France

- Co-located with MODELS 2008

Objective: discuss future challenges in MDE

- What are the current problems and obstacles in MDE ?
- Where should MDE go to in the long term?
- Identify "grand challenges", "revolutionary" new ideas

Commercial break

Dates

- Submission deadline
  4 August 2008
- Workshop date
  20, 29 or 30 September 2008

Website

http://ssel.vub.ac.be/ChaMDE08/

Book « Software Evolution »

- ## Springer, February 2008
  - ISBN 978-3-540-76439-7
- ## Covers current state-of-the-art in software evolution
- ## With contributions by
  Capiluppi, Demeyer, Gall,

  Hainaut, Heckel, Koschke,

  Lanza, Mens, Moonen, Ramil,

  Wermelinger, van Deursen,
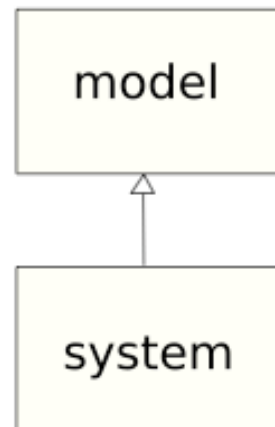
  Zimmermann, Zeller, ...

Tom Mens
Serge Demeyer (Eds.)

**Software
Evolution**

Springer

Model-Driven Software Engineering

- An approach to software development where the principal artifacts are models (as opposed to programs)

Model-Driven Software Engineering
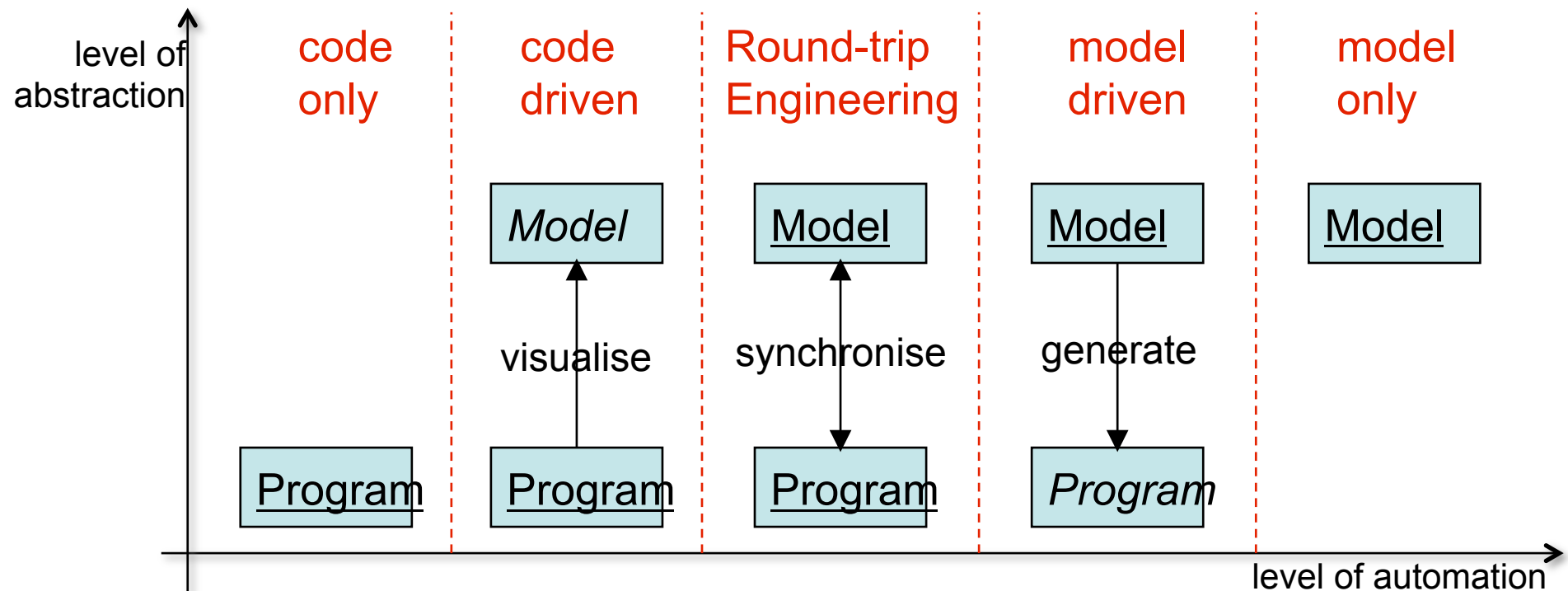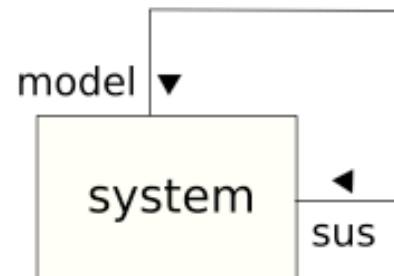
Jean Bézivin

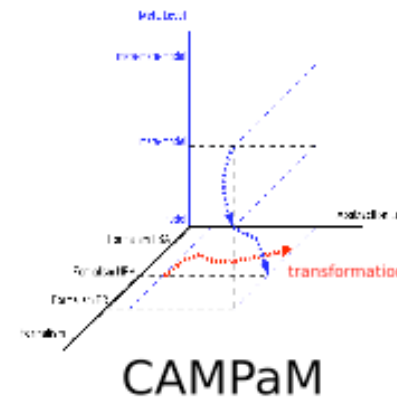Everything is a model !

Jean-Marie Favre

Nothing is a model !

Hans Vangheluwe

Model everything !

Tom Mens

Transform everything !

Challenge:
Model-driven evolution

- Observation
  - Contemporary modeling tools do not adequately address software evolution problems
  - Need better support (tools, formalisms) for
    - model inconsistency management
    - model refactoring
    - model merging
    - ...

- Goal of my research
  - Use formalisms to gain better understanding of, and improve tool support for, these activities of model inconsistency management

My Research in a Nutshell

- **Using description logics**
  - To manage UML model inconsistencies (2003-2004)
    - with R. Van Der Straeten, VUB, Belgium

- **Using graph transformation**
  - To deal with refactoring (2004-2007)
    - with G. Taentzer, Germany
  - To resolve model inconsistencies (2006-2007)
    - with R. Van Der Straeten, Brussels
  - To support ontology evolution (2007)
    - with P. De Leenheer, Brussels

My Research in a Nutshell

- ## Using logic programming
  - To deal with structural and temporal model inconsistencies (2008)
    - with X. Blanc, Paris

- ## Empirical studies of software evolution
  - Eclipse case study
    - with J. Fernandez-Ramil, UMH, Belgium

- ## Formally reason about model evolution
  - ### By using a model transformation mechanism that is
    - Generic, higher-order
      - Applicable to "any" kind of model
    - expressive
      - Suitable mechanisms for control flow, constraints, application conditions, …
    - scalable and efficient
    - reusable and modular
    - That allows for formal reasoning of
      - The models being transformed
      - The model transformations themselves
    - That can be applied at any level (models, metamodels, …)

Main challenges

- Need to represent models and transformations in a uniform way

- Two possible alternatives:
  - Represent transformations as first-class models

  - Represent models as first-class transformations (ICSE 2008 paper)

Useful references

- ## About model transformation
  - T. Mens, P. Van Gorp. *A taxonomy of model transformation*. Proc. GRAMOT 2005, ENTCS 152, Elsevier, 2006

- ## About model inconsistency
  - X. Blanc, I. Mounier, A. Mougenot, T. Mens. *Detecting model inconsistency through operation-based model construction.* Proc. ICSE 2008
  - T. Mens, R. Van Der Straeten. *Incremental resolution of model inconsistencies*. Proc. WADT 2006, LNCS 4409: 111-127
  - T. Mens, R. Van Der Straeten, M. D'Hondt. *Detecting and resolving model inconsistencies using transformation dependency analysis*. Proc. MoDELS 2006, LNCS 4199: 200-214
  - R. Van Der Straeten, T. Mens *et al*. *Using description logics to maintain consistency between UML models*. Proc. UML 2003, LNCS 2863:326-340

Useful references

- ## About model refactoring
  - T. Mens, G. Taentzer, D. Müller. *Model-driven software refactoring.* Book chapter in: Model-driven software development: Integrating Quality Assurance, IDEA Publishing, 2008
  - T. Mens, G. Taentzer, O. Runge. *Analyzing refactoring dependencies using graph transformation*. SoSyM Journal, September 2007
  - R. Van Der Straeten, T. Mens, V. Jonckers. *A formal approach to model refactoring and model refinement*. SoSyM Journal, June 2007
  - T. Mens. On the use of graph transformations for model refactoring. Proc. GGTSE 2005, LNCS 4143: 219-257
  - R. Van Der Straeten, V. Jonckers, T. Mens. *Supporting model refactorings through behaviour inheritance consistencies*. Proc. UML 2004, LNCS 3273: 305-319