



Interuniversity Attraction Poles Programme - Belgian State – Belgian Science Policy

WP7: Incremental design and verification

Initial partners: UCL, ULB, FUNDP

Coordinator: Pierre-Yves Schobbens



MoVES annual meeting



WP7 – GM 7 Feb 2011

Basic idea

- ★ Systems evolve mainly by adding features
- ★ Changes are often incremental
- ★ Radical restructuring is rare, and often refactoring:
no added (visible) functionality, clear mapping
- ★ Thus we hope to reuse designs and proofs
- ★ Might require to structure them differently:
« evolution-ready »

Main topics this year

- ★ Incremental specification and verification of software product lines
(FUNDP, UCL, ULg and ULB)
- ★ Developing feature diagrams verification tools
(FUNDP)
- ★ Incremental synthesis for temporal logic
(ULB, FUNDP)

MoVES-Verif@ASE 2010, September 21st

- ★ ***Realizability of real-time logics: decidability and implementation***
L. Doyen, B. Di Giampaolo, G. Geeraerts, J.-F. Raskin, J. Reichert and N. Sznajder
- ★ ***Decidable Distributed Event Clock Automata***, *J. J. Ortiz and P.-Y. Schobbens*
- ★ **Invited Speaker: [Rupak Majumdar, UCLA](#)**
- ★ ***Implementing High-Level Languages for Software Product Line Model Checking***,
A. Classen, P. Heymans, A. Legay and P.-Y. Schobbens
- ★ ***Combining Partial Order Reduction and Symbolic Model Checking to verify LTL properties***, *J. vander Meulen*
- ★ ***Parameterized Verification of Ad Hoc Networks***, *A. Sangnier*
- ★ ***Symbolic Analysis of Concurrent Programs with Polymorphism***
N. S. Rungta
- ★ ***Modular Lightweight Semantics***
K. Madlener, S. Smetsers and M. van Eekelen
- ★ ***Evolutions of Test Systems***, *P. Y. H. Wong and N. Diakov*

Newsletter n°2

- ★ 9 articles
- ★ 3 WP7 themes

MoVES Newsletter

Work Package 7 - Incremental design and verification
University in Focus: University of Namur

MoVES Newsletter, No. 2, September 2010

Editorial

Dear Reader,

This is the second issue of the MoVES newsletter. MoVES stands for "Modelling, Verification and Evolution of Software" and addresses these fundamental issues in software engineering. The project is sponsored by the Belgian government (belspo IAP programme). Each issue of the newsletter presents a partner and a work package.

This issue presents results and ongoing research of *Work Package 7-incremental design and verification*. The idea of WP7 is to bridge the main topics of the project. Evolution poses a challenge for both modelling and verification: We want to reuse the modelling and verification effort as much as possible when evolving a software system. This requires innovative structuring of the software and the verification process. This issue also presents the *PRECISe Research Centre of the University of Namur (FUNDP)*, and shows the variety of research pursued there.

Enjoy reading!

Pierre-Yves Schobbens, Nicolas Genon and Andreas Classen

Upcoming Events & Recent Joint Publications

- 25th IEEE/ACM International Conference on Automated Software Engineering, **ASE 2010**, 20-24 September 2010, Antwerp Belgium.
 - **IWPSE-Evol 2010**: 4th International Joint ERCIM/IWPSE Symposium on Software Evolution, 20 September.
 - **Moves-Verif**, 21 September.
 - **WASDeTT-3**: 3rd International Workshop on Academic Software Development Tools, 20 September.
- ACM/IEEE 13th International Conference on Model Driven Engineering Languages and Systems, **MODELS 2010**, 3-8 October 2010, Oslo Norway.
 - **ME 2010**: International Workshop on Models and Evolution, 3 October.
 - **ACES-MB 2010**: 3rd International Workshop on Model Based Architecting and Construction of Embedded Systems, 4 October.
- 9th Belgian-Netherlands software eVOLution seminar, **BENEVOL 2010**, 16-17 December 2010, Lille France.
- *Joint publications to appear in Volume 27(4)*, July-August, of **IEEE Software** devoted to *Software Evolution*, with guest editors T. Mens, Y.-G. Guéhéneuc, J. Fernández-Ramil, and M. D'Hondt, with two MoVES contributions:
 - *Reverse Engineering on the Mainframe: Lessons Learned from "In Vivo" Research*, J. van Geet and S. Demeyer.
 - *A Lightweight Sanity Check for Implemented Architectures*, A. van Deursen and E. Bouwers.
- *Submission deadlines*:
 - *October 15th 2010* – 15th European Conference on Software Maintenance and Reengineering, **CSMR 2011**.
 - *October 31st 2010* – Special Issue on "**Automated Software Evolution**" of the Elsevier Journal on Systems and Software.
 - *November 10th, 2010* – 5th International Workshop on Variability Modelling of Software-intensive Systems, **VaMoS 2011**, January 27th - 29th 2011, Namur Belgium.
 - *December 22nd, 2010* – 1st International Workshop on Variability-intensive Systems Testing, Validation and Verification, **VAST 2011**, March 21-25, 2011 - Berlin Germany.
 - *February 14th, 2011* – 19th IEEE International Requirements Engineering Conference, **RE 2011**, August 29th - September 2nd 2011, Trento Italy. The theme will be "**Requirements in Motion**".

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Modelling, Verification and Evolution of Software

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Incremental verification of software families (FUNDP-UCL-Ulg-ULB)

★ Ideas:

- ▶ Develop verification techniques for model-checking adapted to software families
- ▶ Based on a behaviour model tagged by features
- ▶ Checking the whole family in one shot
- ▶ Specialised data structures
- ▶ Both symbolic and enumerative techniques
- ▶ High-level language

Incremental verification of software families (FUNDP-UCL-Ulg-ULB)

★ Presented in:

- ▶ Classen, A.; Heymans, P.; Schobbens, P-Y.; Legay, A. and Raskin, J-F. Model Checking Lots of Systems: Efficient Verification of Temporal Properties in Software Product Lines. In 32nd International Conference on Software Engineering (ICSE 2010), pages 335-344, ACM, 2010.
- ▶ Classen, A.; Heymans, P.; Schobbens, P-Y. and Legay, A. Symbolic Model Checking of Software Product Lines. Accepted for publication at the 33rd International Conference on Software Engineering, ICSE 2011.

Automated verification of feature diagrams (FUNDP)

★Use feature diagrams verification tools (based on SAT or SMT solvers) when generating new programme variants

- ▶ Model-check programme variants (feature combinations)
- ▶ Compute various indicators on legal programme variants (number of such programmes, changes that are always necessary, co-occurring changes, etc.)
- ▶ Study of configuration workflows
- ▶ Computation of feature diagram views

Incremental synthesis for temporal logic

- ★ Synthesis of strategies (= programs) in a game with an objective in temporal logic
- ★ The controller must guarantee the objective even in face of arbitrary environment perturbations
- ★ Doubly-exponential but works on examples
- ★ Extended to real-time logics
- ★ New implementation in project

Future plans

- ★ Pursue and extend current topics
- ★ Stronger links with Aspects, compositionality
- ★ Extend with real-time
- ★ Joint events with WP5 and WP6
- ★ More common theses