Activity Report 2012

Section highlights of the Team

ADAM Project-Team

2.2. Highlights of the Year

We highlight two results that are of particular interest with respect to our annual activity. Both of them deal with the reconfiguration of software systems and are related to PhD theses that have defended in 2012. The first one is concerned with the application of the notion of reconfiguration to software processes in service-oriented architectures. The second one deals with the formalization of quality of service contracts in reconfigurable software systems.

Gabriel Hermosillo's PhD thesis [11], that was defended on 5 June 2012, deals with reconfigurable middleware, and has provided a solution for dynamically reconfiguring business processes in service-oriented architectures. So far, our results in terms of reconfiguration were mainly in terms of fine-grained artefacts, such as components. This thesis has demonstrated that this property can be achieved for coarse-grained artefacts, such as business processes. This opens interesting perspectives, especially in terms of industrial impact, since many complex workflow activities in IT systems are expressed as business processes with stringent needs for adaptation to evolving execution conditions. Furthermore, the thesis demonstrated that the domains of Complex Event Processing (CEP) [107] can be integrated in a comprehensive framework where events and their processing rules are the triggering conditions for process adaptation. This has resulted in the development of the CEVICHE framework that was the topic of several major publications [104], [103], [114] in addition to the thesis manuscript itself.

Gabriel Tamura's PhD thesis [12], that was defended on 28 May 2012, deals with the reliable preservation of quality of service (QoS) contracts in component-based software systems under changing conditions of execution. In response to this challenge, the presented contribution is twofold. The first one is a model for component-based software applications, QoS contracts and reconfiguration rules as typed attributed graphs, and the definition of QoS-contracts semantics as state machines in which transitions are performed as software reconfigurations. Thus, we effectively use (formal) models at runtime to reliably reconfigure software applications for preserving its QoS contracts. More specifically, we show the feasibility of exploiting design patterns at runtime in reconfiguration loops to fulfill expected QoS levels associated to specific context conditions. We realize this formal model through a component-based architecture and a reference implementation that can be used to preserve the QoS contracts of executed middleware applications. The second contribution is the characterization of adaptation properties to evaluate self-adaptive software systems in a standardized and comparable way. By its own nature, the adaptation mechanisms of self-adaptive software systems are essentially feedback loops as by defined in control theory. Thus, it is reasonable to evaluate them using the standard properties used to evaluate feedback loops, re-interpreting these properties for the software domain. We define the reliability of our formal model realization in terms of a subset of the characterized adaptation properties, and we show that these properties are guaranteed in this realization. This has resulted in the development of the QOS-CARE framework that was the topic of several major publications [66], [67], [63], [127] in addition to the thesis itself.

ATEAMS Project-Team

2.2. Highlights of the Year

Paul Klint was awarded the CWI Fellowship, for lifetime contributions to science and CWI in particular. This distinction is given to prominent researchers at Centrum Wiskunde & Informatica (CWI) in Amsterdam for their contribution to CWI's research and administration.

Floor Sietsma defended her PhD on December 13, 2012. This makes her the *youngest PhD in Dutch academic history*, at 20 years old. Remarkably, Floor Sietsma has still two years of research time to go, for her thesis preparation took her about half of the allotted four years. NWO granted her a personalized grant on account of her unusual talents. Sietsma will stay at CWI and use the rest of her research grant to expand her research on the formal analysis of communication, exploring connections with data stream analysis, cryptography and agent technology in artificial intelligence.

BONSAI Project-Team (section vide)

DART Project-Team (section vide)

DOLPHIN Project-Team

2.2. Highlights of the Year

- Francois Clautiaux: Premier accessit for Prix Robert Faure 2012.

- Best paper award at conference ICORES'2012 1st International Conference on Operations Research and Entreprise Systems, Vilamora, Portugal, Feb 2012 [44] . Rita Macedo, Said Hanafi, Francois Clautiaux, Claudio Alves, José Valério de Carvalho, Generalized disaggregation algorithm for the vehicle routing problem with time windows and multiple routes.

- Best paper award at GECCO'2012 (Genetic and Evolutionary Computation Conference, EMO Track), Philadelphia, USA, July 2012 [37] . D. Brockhoff, T. Wagner, H. Trautmann, On the Properties of the R2 Indicator.

BEST PAPERS AWARDS :

[44] **ICORES 2012, 1st International Conference on Operations Research and Entreprise Systems, Vilamora, Portugal, 4-6 february, 2012**. R. MACEDO, S. HANAFI, F. CLAUTIAUX, C. ALVES, J. M. VALÉRIO DE CARVALHO.

[37] **GECCO'2012**. D. BROCKHOFF, T. WAGNER, H. TRAUTMANN.

FUN Team

2.2. Highlights of the Year

The DECARTE funding project received the European RFID Award in March 2012 by RFID European Lab of ESCP Europe.

MINT Project-Team

2.2. Highlights of the Year

- F. Giraud, M. Amberg, B. Lemaire-Semail, G. Casiez, P. Olivo and N. Roussel's demonstration of transparent tactile devices was nominated for the best demonstration award by the HAPTICS 2012 conference (Vancouver, March 4-7);

- About 500 people participated in FITG 2012, the third *Forum on Tactile and Gestural Interaction* co-organized by N. Roussel in cooperation with Plaine Images (November 13-14) in Tourcoing;

- equipex IrDIVE has been funded by french ministry of research, and started officially 1st of january 2012 (scientific coordinator Yann Coello, Pr. psychology of university Lille 3, ends in 2020); it gathers 3600 Keuros from ANR, associated to 3000 Keuros of FEDER funds; this platform is associated to a pluridisciplinary scientific project, that associates Lille 1 and Lille 3 universities, and gathers computer scientists, psychologists, and historians of arts. L. Grisoni is responsible for the art-science activity in this initiative.

MODAL Project-Team

2.2. Highlights of the Year

- The team finished the development of the blockcluster R package, allowing to process efficient and parsimonious generative models on huge data sets for different kinds of variables (see Section 5.2).

- The team developed also a R package of MIXMOD and started to develop a new version for simultaneous mixed categorical and continuous data (see Section 5.1).

MOSTRARE Project-Team (section vide)

NON-A Project-Team

2.3. Highlights of the Year

- The survey paper on delay systems [126] is the ScienceDirect TOP 1 hottest article of Automatica since July 2009;

- HdR of Join C. "Une approche algébrique pour la pratique de l'estimation, du diagnostic, de la commande et de la finance" [12], Université de Lorraine, June 2012;

- HdR of Efimov D. "Analysis, control and estimation of nonlinear oscillations" [11], Inria, November 2012;

- Patent pending (FR11/51604) on the control of traffic flow.

RMOD Project-Team

2.4. Highlights of the Year

- *Emergence Award*: Synectique is a startup project of RMoD around building customized software analysis tools. The project participated in the competition by French Ministry of research and higher education for innovative projects ("Concours OSEO"). The project was selected in the competition and won an award of 30K€ to develop its activities (http://rmod.lille.inria.fr/web/pier/blog/synectique-oseo).

- Moose 4.6 (our open-source reengineering platform) was released (http://www.moosetechnology.org/).

- Pharo 1.4 (our open-source language and environment) was released (http://www.pharo-project.org).

- RMoD organized the first Pharo Conference during two days in May (60 participants).

- RMoD participated to the organization of the ESUG conference in Ghent, Belgium in August (130 participants).

- Marcus Denker got promoted to CR1.

- RMoD launched the Pharo Consortium and the Pharo Association.

SEQUEL Project-Team (section vide)

SHACRA Project-Team

2.3. Highlights of the Year

2.3.1. *Two full papers at MICCAI'2012 in Nice*

Two full papers have been accepted in the International Conference on Medical Imaging Computing and Computer Assisted Intervention (MICCAI, ERA's Ranking A).

2.3.2. *IHU Mix-Surg and Haystack Project*

The team is involved in the creation of the IHU Mix-Surg in Strasbourg, a new institute dedicated to minimally invasive therapies, guided by image and simulation. It involves interdisciplinary expertise of medical groups, academic partners and strong industry partnerships. IHU has provided financial support for a project named Haystack (image guided surgery for brachyterapy).

2.3.3. *HelpMeSee Project*

The team has been involved on a project funded by the non-governmental organization *HelpMeSee*[1]. HelpMe-See aims at providing ways to treat cataract surgery in third world countries. Their main objective is to develop a simulator to train surgeons. Shacra has been involved for its expertise in real-time simulation of soft anatomical structures.

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[1]http://www.helpmesee.org

SIMPAF Project-Team (section vide)