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Software Components, Architectures and Reuse

J.UCS Special Issue

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The aim of this special issue is to report the state of research and practice on the theme of software components, architectures, and reuse. This special issue is comprised of selected, extended peer-reviewed papers presented at the 3nd Brazilian Symposium on Software Components, Architectures, and Reuse (SBCARS 2009), held in Natal, Rio Grande do Norte, Brazil, 9-11 September 2009 (http://www.dimap.ufrn.br/sbcars2009/en/index.html), and papers selected following an open, international Call for Papers.

The call for this special issue received 11 submissions. Moreover, well-known researchers in the area were invited to submit papers. Such submissions originated from co-authors of 6 countries (Brazil, France, Mexico, Spain, United Kingdom, and USA).

Each submitted paper was reviewed by at least 3 reviewers. They are well-known researchers in the area, coming from 12 countries (Australia, Belgium, Brazil, France, Ireland, Italy, Portugal, Spain, Sweden, The Netherlands, Tunisia, and USA).

After a thorough reviewing process, 7 submissions were selected to provide revised versions based on the reviewer's recommendations. These revised versions were then checked by the corresponding reviewers and 5 high-quality papers were finally selected to be included in this special issue. This special issue is composed by these 5 papers as well the 2 invited papers. They present high-quality research carried out by co-authors from Brazil, France, Spain, United Kingdom, and USA.

Contents of this Issue

The first paper, entitled "Modeling Quality Attributes with Aspect-Oriented Architectural Templates" (M. Pinto, L. Fuentes) presents an approach to formally specify all the different kinds of dependencies between concerns belonging to the same or to different functional quality attributes (FQAs). The paper proposes to use AO-ADL, an aspect-oriented architectural description language, to specify quality

attributes by means of parameterizable, and thus reusable, architectural patterns. The paper focuses on quality attributes that: (1) have major implications on software functionality, requiring the incorporation of explicit functionality at the architectural level; (2) are complex enough as to be modeled by a set of related concerns and the compositions among them, and (3) crosscut domain specific functionality and are related to more than one component in the architecture.

The second paper, entitled "Bio-Inspired Mechanisms for Coordinating Multiple Instances of a Service Feature in Dynamic Software Product Lines" (J. Lee, J. White, O. Storz), addresses the problem of coordinating multiple instance of a service feature in Dynamic Software Product Lines (DSPL). The paper investigates the use of principles from self-organization in biological organisms to provide a decentralized decision-making mechanism to seamlessly integrate new instances of a service feature without the need of an omniscient central controller.

The third paper, entitled "Automatically Checking Feature Model Refactorings" (R. Gheyi, T. Massoni, P. Borba), addresses the application of refactoring to Feature Models (FMs) to assist in the evolution of Software Product Lines (SPLs). Feature Models (FM) are efficient encoded in the Alloy formal specification language. Based on this encoding, the Alloy Analyzer, which is a tool used to perform analysis on Alloy models, helps refactoring designers to automatically and efficiently check whether a FM refactoring is sound. Moreover, the proposed approach not only tests whether a transformation is a refactoring, but also shows a counterexample when it is not a refactoring, which is helpful in finding likely bugs in the transformation.

The fourth paper, entitled "QoS-based Approach for Dynamic Web Service Composition" (F. Oliveira Jr., J. Oliveira), addresses Dynamic Web Services Compositions. It presents a QoS based approach for service composition that takes into account the composition overall quality. The proposed approach performs Dynamic Service Composition taking into account both the semantic description of a service and its non-functional properties that composes the quality it delivers. The algorithm to perform this composition receives as input a request, which consists of the provided input concepts, required output concepts and QoS constraints, and produces as output a set of services that together can provide the required concepts specified in the request.

The fifth paper, entitled "An Aspect-Oriented Framework for Weaving Domain-Specific Concerns into Component-Based Systems" (F. Loiret, R. Rouvoy, L. Seinturier, D. Romero, K. Sénéchal, A. Plšek), presents the Hulotte framework, which aim at supporting compositional construction and development of applications that must meet various extra-functional/domain-specific requirements. The Hulotte framework is based on Aspect Oriented techniques, employing an incremental weaving process, combining aspects and components homogeneously from the application down to the implementation platform. At the application level, the system is designed as a software architecture centered on the business logic and is incrementally specialized using domain specific annotations. At the platform level, annotations are reified as an aspect, which is implemented as a fine-grained component-based architecture. Containers are then used as a base infrastructure, in which domain specific concerns can be injected and composed to generate dedicated containers, which conform to the domain-specific requirements of the application.

The sixth paper, entitled "Context-Aware Composition and Adaptation based on Model Transformation" (J. Cubo, C. Canal, E. Pimentel), presents an approach to support composition and adaptation of software components based on model transformation. Such approach considers mismatch problems that may occur at three interoperability levels: (1) signature, (2) behavioural, (3) quality of service and semantic. Signature and behavioral levels are addressed by means of transition systems. Context-awareness and semantic-based techniques are used to tackle quality of service and semantic, respectively, but also both consider the signature level. One interesting point is that the paper demonstrates that software composition and adaptation can be of real interest for widely used implementation platforms such as Window Foundation - WF (.NET), and can help the developer when building software applications by reusing software components. The formal foundations of the different steps of the proposal have been implemented in a set of prototype tools constituting the framework DAMASCO, which has been validated through several examples.

The seventh paper, entitled "An Approach for Feature Modeling of Context-Aware Software Product Line" (P. Fernandes, C. Werner, E. Teixeira), presents UbiFEX, an approach to support feature analysis for context-aware software product lines, which incorporates a modeling notation and a mechanism to verify the consistency of product configuration regarding context variations. UbiFEX includes two parts: UbiFEX-Notation, a feature notation extension developed to explicitly represent context information in a feature model; and UbiFEX-Simulation, a mechanism developed to verify the consistency of product configuration regarding context variations.

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