Project MONDRIAN

III Research Workshop on

Foundations for architectural design

Universidade do Minho, Braga, Portugal

15 October, 2012

Organisation
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Venue:
DI Meeting room
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Programme

11.00 **Calculating statistically indistinguishable recursive functional programs**
(J. Nuno Oliveira, HASLab, INESC TEC - UMinho)

Abstract
Triggered by interest in predicting how faults propagate in functional programs, we exploit the adjunction between distribution-valued functions and column stochastic matrices. While the first are monadic and "good for programming", the latter are "good for calculation". We show how the "matrices as arrows" approach to linear algebra helps in setting up, in this context, a "linear algebra of programming" whose laws enable one to fuse and transform "faulty" programs with each other, while preserving their statistical behaviour. Our examples include probabilistic-fold fusion and a probabilistic mutual recursion law which shows how probabilistic double recursion can be turned into probabilistic iteration and so on.

11.45 **Architectural reconfiguration of interacting services**
(Nuno Oliveira, HASLab, INESC TEC - UMinho)

Abstract
Architectural reconfiguration of interacting services Models for exogenous coordination provide powerful "glue-code", in the form of software connectors, to express interaction protocols between services in distributed applications. Connector reconfiguration mechanisms play, in this setting, a major role to deal with change and adaptation of interaction protocols. This talk introduces a model for connector reconfiguration, based on a collection of primitives as well as a language to specify connectors and their reconfigurations.

12.15 **Coalgebraic bisimulation-up-to**
(Alexandra Silva, UNijmegen & HASLab, INESC TEC)

Abstract
In this talk we present a systematic study of bisimulation-up-to techniques for coalgebras. This enhances the bisimulation proof method for a large class of state based systems, including labelled transition systems but also stream systems and weighted automata. Our approach allows for compositional reasoning about the soundness of enhancements. Applications include the soundness of bisimulation up to bisimilarity, up to equivalence and up to congruence. All in all, this gives a powerful and modular framework for simplified coinductive proofs of equivalence. .

12.45 **Lunch**

14.15 **Coalgebraic logic and self-reference**
(Lutz Schroder, Friedrich-Alexander-Universitat Erlangen-Nurnberg)

Abstract
Decidability of modal logics tends to break down quickly when features for self-reference are added, such as the down-arrow binder of hybrid logic, or its single-variable version popularized by Marx as the I-me construct. We have shown in earlier work that decidability (and in fact low complexity) of logics with I-me is regained if the number of modal operators between between each use of me and its enclosing I is bounded by two; these results are stable under adding graded modalities. Here, we report on ongoing work aimed at a coalgebraic generalization of the algorithmic principles involved, in particular a PSPACE upper bound for local reasoning.

15.00 **A generalised Lawson duality**
(Dirk Hofmann, UAveiro)

Abstract
In this talk we describe a duality for quantale-enriched categories that extends the Lawson duality for continuous dcpos. This is joint work with Pawel Waszkiewicz.

15.30 **The Vietoris monad and the monoidal structures on the Kleisli category induced by the cartesian product**
(Pedro Nora, UAveiro)

Abstract
The Vietors monad plays a central role in duality theory for modal algebras. In this talk we will study this monad and its properties, in particular the Kock-Zoberlein property. Moreover, we investigate the monoidal (closed) structures on the Kleisli category of V induced by the Cartesian product and attempt to shed some light on the corresponding operation at the algebraic side.

16.00 **Coffee break**

16.15 **On the specification of reconfigurable systems**

(Alexandre Madeira, UMinho-UAveiro - Critical Software (MAP-i))

Abstract

This talk provides an overview our research programme on specification logics for reconfigurable systems specification, i.e., for systems which execution modes, and not only the values stored in its internal memory, change in response to the continuous interaction with an external environment. The starting point for our approach, is that the functionality offered by a reconfigurable system, at each moment, may depend on the stage of its evolution. We model the reconfiguration dynamics as a transition structure, whose nodes are interpreted as different execution modes. Therefore, each of such nodes is endowed with a first-order structure modelling its (mode) local functionality. Properties of these local models are expressed over the signature underlying the actual systems' interface. Thus, models are structured state-machines whose states denote first-order-structures, rather than sets. Once chosen the semantics, the next issue concerns the definition of a suitable specification logic. Modal languages are the natural choice to talk about transition systems. Modal logic, however, is not expressive enough to deal with properties holding in specific states, a limitation which is overcome in hybrid variants by considering a special set of symbols for naming states. Additionally, we need to specify each local configurations, at each state, as a first-order structure. This entails the need for combining hybrid, modal features with first-order logic. The wide range of specification formalisms specified as institutions motivated the extension of this idea on the development of an institution independent methodology to specify reconfigurable systems. Previous results in the Mondrian project lead to the development of a systematic method to extend arbitrary institutions with hybrid logic features. Concretely, they are extended with Kripke semantics, for multi-modalities with arbitrary arities, as well as nominals and local satisfaction operators. Finally, we mention some recent results on handling reconfigurations triggered by the system's current state as captured in its state variables. This is achieved by considering syntactically restricted, quantifications over modalities in a suitable presentation of a variant of the institution of hybrid first order logic with enriched signatures.

16.45 **Tool support for hybridised logics**

(Renato Neves, UMinho-UAveiro)

Abstract

Recent research in the Mondrian project, emphasised the need for very expressive logics to specify transition systems. First order hybrid logic looks like a natural candidate for the job, but there is a lack of tools around it. In this talk, we will show how to fullfill a part of this gap resorting to the hybridisation of CASL. Also, a short peek will be given on an experimental language which can hybridise an arbitrary logic. Finally, a method for translating hybridised FOL specifications to FOL will be discussed. Some small case studies will be shown, and we will give a short comparison with their specification in hybrid propositional logic and resorting to dedicated provers.

17.15 **L-ization, impossible generic automation, why?**

(João Melo, UMinho)

Abstract

L-ization is the process of adding a Fragment L to an arbitrary Institution. In this brief presentation one explain the practical limitations found while trying to implement such automatism in HETS.