

9th Wessex Theory Seminar

The ninth meeting of the Wessex Theory Seminar will take place on Thursday 4th November 2010 at Imperial College London. Talks will be held in Room 343 of the Department of Computing, 180 Queen's Gate.

Programme

- 13.15 Edmund Robinson: [Functional Interpretations and Proof Mining](#)
- 13.45 Peter Mosses: [On bisimulation and modularity](#)
- 14.15 Coffee Break
- 14.45 Ross Horne: [Linked Data Algebra](#)
- 15.30 Coffee Break
- 16.00 Achim Jung: [The Hofmann-Mislove Theorem](#)
- 17.00 Short Break
- 17.15 Jan Rutten [Exercises in coalgebra – a coinductive proof of Moessner's theorem](#)
- 18.00 Close.

Abstracts

Edmund Robinson

Functional Interpretations and Proof Mining

Goedel's Dialectica interpretation has recently gained new life as a way of getting constructive information from classical proofs. This talk gives an introduction to the transformation, describes some previous work due to Oliva and Kohlenbach and introduces some new work of Oliva and Powell. It concludes with a recap on the structure of the transformation from a more semantic perspective.

Peter Mosses

On bisimulation and modularity

Sound behavioral equations on open terms may become unsound after conservative extensions of the underlying operational semantics. Providing criteria under which such equations are preserved is extremely useful; in particular, it can avoid the need to repeat proofs when extending the specified language.

In this talk we consider preservation of sound equations for several notions of bisimilarity on open terms: closed-instance (ci-) bisimilarity and formal-hypothesis (fh-) bisimilarity, both due to De Simone (1) and hypothesis-preserving (hp-) bisimilarity, due to Rensink (2).

We give simple examples showing that for ci-bisimilarity, sound equations on open terms are not preserved by disjoint extensions. For both fh-bisimilarity and hp-bisimilarity, arbitrary sound equations on open terms are preserved by all disjoint extensions which do not add labels. Moreover, for slight variations of fh- and hp-bisimilarity, all sound equations are preserved by arbitrary disjoint extensions. See (3) for further details and proofs.

References:

(1) R. de Simone (1985): Higher-Level Synchronizing Devices in MEIJE-SCCS. *Theoretical Computer Science* 37, pp. 245–267.

(2) A. Rensink (2000): Bisimilarity of Open Terms. *Information and Computation* 156, pp. 345–385.

(3) P. D. Mosses, M. R. Mousavi & M. A. Reniers (2010): Robustness of Equations Under Operational Extensions.

Proc. EXPRESS 2010. EPTCS, to appear; preliminary version available.

Ross Horne

Linked Data Algebra

On the 15th October 2010 the first specification of SPARQL Update with operational semantics was published by the W3C. SPARQL Update is a proposed language for updating RDF, where RDF is the semi-structured data format of the project to establish a Web of Linked Data.

Independently, I have been working on an operational semantics for SPARQL Update. The operational semantics are expressed in terms of a new process calculus, called the syndication calculus. Surprisingly, the process calculus turns out to resemble a fragment of Linear Logic. This is due to the resource sensitivity and synchronisation primitives required to control updates. Furthermore, bisimulation derives an algebra over updates, which establishes a verified basis for optimisations. The algebraic properties established lead to speculation that the setting for programming Linked Data is a calculus which covers a larger fragment of Linear Logic and is sound with respect to some Hopf-module over a quantale. I conclude by reflecting on the value of such interactions between the intuition of an engineering problem and the foundations of programming languages.

Achim Jung

The Hofmann-Mislove Theorem

The Hofmann-Mislove Theorem states that there is a bijection between Scott-open filters of open sets and compact saturated subsets of a sober space. What is to all appearances a technical result from Stone duality has over the years been found to play a central role in mathematical semantics. In this talk I plan to give an introduction to the theorem, its setting, its proof, its applications, and a more recent generalisation to four-valued logic.

Jan Rutten

Exercises in coalgebra – a coinductive proof of Moessner's theorem

Coinduction has come to play an ever more important role in theoretical computer science, for the specification of and reasoning about infinite data structures and, more generally, automata with infinite behaviour.

In this talk, we shall focus on a recently introduced formalism for coinductive definitions: behavioural differential equations, with which one specifies behaviour in terms of initial outputs and behavioural derivatives (next state operators). Our emphasis will be on the elementary calculus of streams (infinite sequences), of which we shall discuss the basic theory, developed in close analogy to mathematical analysis.

As an application area, we will discuss a coinductive calculus of periodic stream operators. Using this calculus, we will give a new and transparent proof of Moessner's theorem (1951) using coinduction. This theorem gives a surprising construction for the stream of powers n^k of the natural numbers (such as 1,8,27,64, ... for $k=3$) out of the stream of natural numbers by an alternating process of stream sampling and taking partial sums.

This is joint work with Milad Niqui (CWI).

Attendance

From Bath:

- Martin Churchill
- Pierre Clairambault
- Anupam Das
- Guy McCusker
- John Power
- Cai Wingfield

From Birmingham:

- Achim Jung

From Imperial:

- Faris Abou-Saleh
- Nick Bezhaniashvili
- Fredrik Dahlqvist
- Andrew V. Jones
- Clemens Kupke
- Björn Lellmann
- Dirk Pattinson
- Florian Widmann

From Queen Mary:

- Paulo Oliva
- Edmund Robinson
- Tom Powell
- Dan Hernest
- Rob Arthan

From Southampton:

- Gabrielle Anderson
- Ross Horne
- Corina Cirstea
- Toby Wilkinson
- Tristan Aubrey-Jones

From Swansea:

- Ulrich Berger
- Tie Hou
- Peter Mosses
- Monika Seisenberger

From CWI (Netherlands):

- Jan Rutten

From McGill (Canada):

- Prakash Panangaden