

2012/2013
**Seminar
Series**

[www.cs.unb.ca/
seminarseries](http://www.cs.unb.ca/seminarseries)

**Higher-order Multidimensional
Programming**

By:

**John Plaice
The University of New South
Wales**

We present a higher-order functional language in which variables define arbitrary-dimensional entities, where any atomic value may be used as a dimension, and a multidimensional runtime context is used to index the variables. We give an intuitive presentation of the language, present the denotational semantics, and demonstrate how function applications over these potentially infinite data structures can be transformed into manipulations of the runtime context. At the core of the design of functions is the intension abstraction, a parameterless function whose body is evaluated with respect to the context in which it is used and to part of the context in which it is created.

The multidimensional space can be used for both programming and implementation purposes. At the programming level, the informal presentation of the language gives many examples showing the utility of describing common computing entities as infinite multidimensional data structures. At the implementation level, the main technical part of the paper demonstrates that the higher-order functions over infinite data structures---even ones that are curried---can be statically transformed into equivalent functions directly manipulating the context, thereby replacing closures over parts of the environment by closures over parts of the context.

Dr. John Plaice (BMath 1979, University of Waterloo, Canada; PhD 1984, Grenoble Institute of Technology, France; Habilitation 2010, University of Grenoble) is Adjunct Associate Professor at The University of New South Wales, Sydney, Australia.

He wrote the first semantics and compiler for Lustre (Synchronous Real-Time Lucid), the core real-time programming language in Esterel Technologies's Scade Suite, the leading solution in Europe for developing embedded software meeting stringent avionics standards. Since then, he has developed numerous techniques for adaptation to context, in programming languages, software configuration, electronic documents and digital typography.

**Wednesday, November 14 @ 3:00pm
Information Technology Centre ITC317**