Math. Struct. in Comp. Science (2007), *vol.* 17, *pp.* 585–586. © 2007 Cambridge University Press
doi:10.1017/S0960129507006196 Printed in the United Kingdom

More developments in computational models: introduction

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Received 10 November 2006

This second special issue devoted to 'developments in computational models' (the first was Volume 16 Issue 4) came out of an open call for papers following the *First International Workshop on Developments in Computational Models* (DCM). This took place in Lisbon, Portugal, on the 10th July 2005, and was a satellite event of ICALP 2005 focused on abstract models of computation and their associated programming paradigms.

DCM 2005 brought together researchers working on a broad range of computability-related issues, including the development of new computational models or new features of traditional computational models. It provided a forum for the presentation of new ideas and work in progress, as well as enabling newcomers to learn about current activities in this area.

Thirteen papers were presented in the first DCM workshop, covering a wide range of topics including functional computations, object-oriented languages, rewriting calculi, mobility, interaction nets, calculi for reconfiguration, quantum computing, evolutionary processors and chemical machines.

The first special issue contained six articles, and four additional articles have been selected for this issue. These cover a range of computation models, including bio-inspired evolutionary networks, powerful object oriented calculi, a new analysis of the interplay between communication and mobility in ambient calculi, and a description of a new computation paradigm based on module reconfiguration. The following subsections give brief details of each paper.

Ambient calculi, mobility and communication

The paper *Boxed ambients with communication interfaces* by Pablo Garralda, Eduardo Bonelli, Adriana Compagnoni and Mariangiola Dezani-Ciancaglini introduces an ambient calculus with a flexible communication policy. A distinctive property of this calculus is the ability to separate communication and mobility by making the channels of communication between ambients explicit. Each ambient is equipped with a description of the communication policies ruling the exchange of information between it and its parent and children ambients, and these communication policies may change as the ambient

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moves. This is the first ambient calculus to provide the flexibility for ambients to adapt their communication patterns depending on the current state of the system.

Object-oriented calculi

The paper *Coalgebraic description of generalised binary methods* by Furio Honsell, Marina Lenisa and Rekha Redamalla provides a coalgebraic foundation for the specification and refinement of objects with binary methods in class-based object-oriented languages. Binary methods are methods that take more than one argument of the hosting class, and for this reason they do not fit into the standard coalgebraic approach. In this paper, the authors model classes as bialgebras, and describe two novel approaches to deal with binary methods. Both approaches are based on the idea that a binary method can be transformed into a bunch of unary methods that capture the original behaviour. The set of unary methods is obtained in the first approach by means of a covariant freezing functor, and in the second approach through a graph functor.

Calculi for reconfiguration

The paper *A calculus of open modules: call-by-need strategy and confluence* by Sonia Fagorzi and Elena Zucca presents a calculus of configurations that correspond to partially defined modules, that is, modules that still need to import some definitions. This can be seen as a model of computation in which standard execution (that is, execution of a single thread described by a fragment of code) can be interleaved with operations that manipulate the context in which the computation takes place. In addition to proving confluence of the reduction relation, the paper presents type systems for the calculus and an in-depth study of call-by-need evaluation strategies.

Evolutionary processors

The paper *On the size complexity of universal accepting hybrid networks of evolutionary processors* by Florin Manea, Carlos Martín-Vide and Victor Mitrana deals with a recently introduced bio-inspired computing model: accepting hybrid networks of evolutionary processors (AHNEP). After giving an insightful description of this model of computation, the authors proceed to answer the following question: how many processors are required in an AHNEP in order to recognise a given language? Two different answers are given for a recursively enumerable language L:

1 The network has a number of processors linearly bounded by the cardinality of the tape alphabet of a Turing machine recognising the given language.
2 An AHNEP with a fixed underlying structure can accept any recursively enumerable language.

The second of these involves the definition of a universal AHNEP.

Acknowledgements

We would like to thank the authors who contributed to this special issue, and the referees who worked diligently to evaluate and help improve the papers. We also owe a very special thanks to Giuseppe Longo, the editor-in-chief of Mathematical Structures in Computer Science, for his constant support, which made this issue possible.