BRICS Newsletter

Basic Research in Computer Science June 94

In this Issue

Welcome

Welcome to the first issue of the BRICS newsletter. Its purpose is to inform you of appointments, publications, courses and other activities within BRICS. Further details can be obtained by contacting the addresses below.

First a word about the research centre BRICS:

BRICS, a Centre for Basic Research in Computer Science, is funded by the Danish National Research Foundation for the period 1994–1998. Its aim is to establish in Denmark important areas of basic research in the mathematical foundations of Computer Science, notably Algorithmics and Mathematical Logic, alongside existing activities in Semantics of Computation. The Centre is based at the Department of Computer Science, University of Aarhus, in association with the Department of Mathematics and Computer Science, Aalborg University. The research plan is based on a commitment to fulfil the aims, using a combination of long-term efforts and a number of short-term, intensive programmes, within carefully chosen scientific themes.

BRICS Activities

Theme

This year's theme is within *Complexity Theory*. Visits and activities are to take place in August and September. So far the following have agreed to visit:

Miklos Ajtai, Oded Goldreich, Mark Jerrum, Noam Nisan, Alexander Razborov, Shmuel Safra, Mike Saks, Adi Shamir and Avi Wigderson.

In particular, there will be a workshop in the 3rd week of August with a limited number of participants. As a lead-in to the workshop, it is planned in the previous week to have some introductory seminars aimed at PhD students and others who are not “experts” in complexity theory.

The organisers are Shmuel Safra, Hebrew University, Jerusalem and Sven Skyum — e-mail enquiries to `<sskyum@daimi.aau.dk>`.

SWAT

6–8 July, SWAT '94, *Fourth Scandinavian Workshop on Algorithm Theory*, University of Aarhus; organised by S. Skyum, E. Meineche Schmidt (chair `<SWAT@daimi.aau.dk>`) and G. Skovbjerg Frandsen.

Nordic Workshop

17–19 October, *6th Nordic Workshop on Programming Theory*, University of Aarhus; organised by P. D. Mosses and K. Guldstrand Larsen (see conference announcements in the 53 issue of the EATCS Bulletin or Activities of BRICS WWW).

TAPSOFT

22–26 May, TAPSOFT '95, *Sixth International Joint Conference on the Theory and Practice of Software Development*, University of Aarhus; organised by P. D. Mosses (chair `<tapsoft@daimi.aau.dk>`), M. Nielsen, M. I. Schwartzbach (see Activities of BRICS WWW).

Theme for '95

The theme for '95 is to be *Logic in Domain Theory* concentrating on such topics as: proof principles for reasoning about recursively-defined domains (see Andy Pitts' course in "Forthcoming Courses" and "Calendar of Events"), synthetic domain theory, full abstraction and stable and sequential domain theory. In order to avoid clashes with the programme at the Isaac Newton Institute at Cambridge, it is intended that the bulk of activities will take place before late summer '95, with at least one activity (Andy Pitts' mini-course) in late '94.

Forthcoming Courses

Induction Based on Rippling and Proof Planning

David Basin, Max Plank Institute, Saarbrcken.

11 August. One-day course.

Abstract: Mathematical Induction is a central technique in reasoning about programs and their properties, e.g., loops and recursion, recursively defined data-structures, and program termination. For researchers interested in establishing these properties on a computer, such reasoning must be automated or at least partially supported. In this five hour seminar some of the central issues in automating proof by mathematical induction will be covered. In particular, formalisms for mathematical induction, techniques for selecting induction schemata and well-founded orders, rewriting in inductive theorem proving, and applications. The topics will often be illustrated using ideas and techniques that have been developed at Edinburgh and embodied in the CLAM Inductive Theorem Proving System.

Inductive and Co-inductive Techniques in the Semantics of Functional Programs

Andrew Pitts, Computer Laboratory, Cambridge University.

21 November – 2 December. Around 8 lectures.

Abstract: The aim of the course will be to describe recent advances in formal techniques for establishing observational equivalence of functional programs. Both operational and denotational methods and the relationship between them will be considered. One goal will be to give an exposition of Howe's method for characterising observational equivalence as a co-inductively defined "applicative bisimulation".

Another goal will be to describe Freyd's analysis of recursively defined domains in terms of a property of mixed initiality/finality. Applications of this to proving correspondence of operational and denotational semantics and to inductive and co-inductive reasoning about "user-declared" data types will be given.

Kernel Researchers

Director
Glynn Winskel, Professor (Aarhus)

Co-Directors
Mogens Nielsen, Associate Professor (Aarhus)

Erik Meineche Schmidt, Associate Professor (Aarhus)

Project Manager
Uffe H. Engberg, (Aarhus)

Kim Guldstrand Larsen, Professor (Aalborg)

Peter D. Mosses, Associate Professor (Aarhus)

Michael I. Schwartzbach, Associate Professor (Aarhus)

Arne Skou, Associate Professor (Aalborg)

Sven Skyum, Associate Professor (Aarhus)

Newly Appointed Researchers

Jaap van Oosten
Category theory, recursion theory, constructive logic.

Sren Mller Riis
Complexity and bounded arithmetic.

Nils Klarlund
Decidable logics, finite-state methods in distributed computing and programming language applications, concurrency.

Dany Breslauer
Algorithms and data structures with emphasis on sequence comparison.

Igor Walukiewicz
Logic, automata, μ-calculus.

Luca Aceto
Specification and verification of reactive systems, concurrency.

The BRICS Logo

The BRICS logo consists of two parts; first the *I Ching* symbol or "hexagram" *Chin* (progress); second the text BRICS (Basic Research in Computer Science) typeset display-typographic in Times Roman.

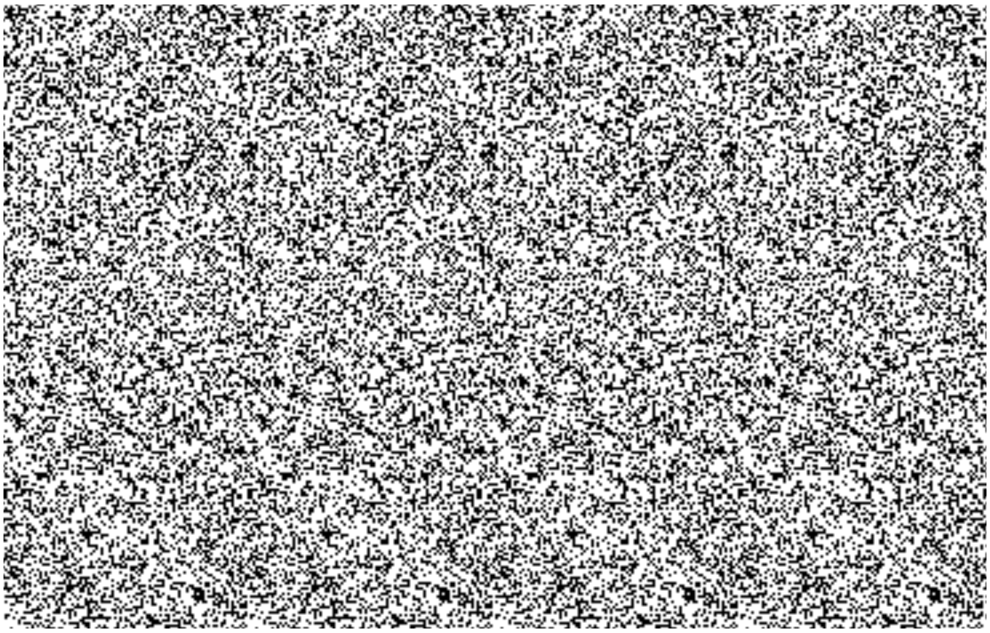
The symbol is the winning proposal, by Christian Lynbech, for a contest at the Department of Computer Science, University of Aarhus. Some reasons for choosing the symbol:

- the reading of the symbol, progress as described below, is a characteristic of the goal of the centre,
- the symbol forms an abstract A, the initial letter of Aarhus and Aalborg,
- the combinatorial ideas behind the groupings of *I Ching* appeals to computer scientists,
- the symbol is built up of "bricks".

The *I Ching* is an ancient Chinese divination technique, a fortune telling system created nearly five thousand years ago.

The basis of I Ching is combinations of random numbers. The throwing of the I Ching consists in flipping coins, six times in a row. The result of a throw is drawn either as a straight unbroken line segment (*Yang*) or as two shorter line segments (*Yin*).

The mathematician, philosopher and emperor Fu Hsi is the first documented practitioner of I Ching and binary combinatorial analysis. Attributed to Fu Hsi are combinations of throws,



Something to meditate on: a stereogram of the BRICS logo

organised into “trigrams”. There are eight trigrams to which Fu Hsi assigned human and natural attributes.

By grouping pairs of trigrams into “hexagrams” a total of sixtyfour combinations can be made. The trigrams *Li* (The Clinging, Flame) and *K'un* (The Receptive, Earth) constitute the hexagram *Chin* (upper and lower trigram respectively).

The current groupings, based on patterns of trigram attributes, were produced by King Wen during his eleven year internment as a political prisoner around 1150 BC. Judgements, i.e. rules, pronouncements, and hints, were attached to each hexagram by King Wen.

Six hundred and fifty years later, Confucius wrote additional text consisting of imagery that involves the trigram attributes which interact within each hexagram. These descriptions are called Images.

The judgement of *Chin* is:

> Progress. The powerful prince.
> Is honoured with horses in great numbers.
> In a single day he is granted audience three times.

And the image:

> The sun rises over the earth:
> The image of progress.
> Thus the superior man himself
> Brightens his bright virtue.

BRICS on World Wide Web

You can now get access to information from BRICS through World Wide Web (WWW) and anonymous FTP. To connect to the BRICS WWW entry, open the URL:

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http://www.daimi.aau.dk/BRICS/
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The BRICS WWW entry contains updated information about most of the topics covered in the newsletter as well as access to electronic copies of information material and reports of the BRICS Series (look under Publications).

To access the information material and reports of the BRICS Series via anonymous FTP do the following:

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ftp ftp.daimi.aau.dk
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get README.
```

BRICS Report Series, 1994

ISSN 0909-0878

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[RS-94-1] Glynn Winskel. *Semantics, Algorithmics and Logic: Basic Research in Computer Science. BRICS Inaugural Talk*. February 1994, 8 pp.

[RS-94-2] Alexander E. Andreev. *Complexity of Nondeterministic Functions*. February 1994, 47 pp.

[RS-94-3] Uffe H. Engberg and Glynn Winskel. *Linear Logic on Petri Nets*. February 1994, 54 pp. To appear in: *Proceedings of REX '93*, LNCS, 1994.

[RS-94-4] Nils Klarlund and Michael I. Schwartzbach. *Graphs and Decidable Transductions based on Edge Constraints*. February 1994, 19 pp. Appears in: *Trees in Algebra and Programming CAAP '94* (ed. S. Tison), LNCS 787, 1994.

[RS-94-5] Peter D. Mosses. *Unified Algebras and Abstract Syntax*. March 1994, 21 pp. To appear in: *Recent Trends in Data Type Specification* (ed. F. Orejas), LNCS 785, 1994.

[RS-94-6] Mogens Nielsen and Christian Clausen. *Bisimulations, Games and Logic*. April 1994, 37 pp. Full version of paper appearing in: *New Results and Trends in Computer Science*, pages 289–305, LNCS 812, 1994.

[RS-94-7] André Joyal, Mogens Nielsen, and Glynn Winskel. *Bisimulation from Open Maps*. May 1994, 42 pp. Journal version of LICS '93 paper.

[RS-94-8] Javier Esparza and Mogens Nielsen. *Decidability Issues for Petri Nets*. 1994, 23 pp. Appears in EATCS Bulletin 52, pages 245–262, 1994.

[RS-94-9] Gordon Plotkin and Glynn Winskel. *Bistructures, Bidomains and Linear Logic*. May 1994, 16 pp. To appear in the proceedings of ICALP '94, LNCS, 1994.

[RS-94-10] Jakob Jensen, Michael Jørgensen, and Nils Klarlund. *Monadic second-order Logic for Parameterized Verification*. May 1994, 14 pp.

[RS-94-11] Nils Klarlund. *A Homomorphism Concept for ω-Regularity*. May 1994.

[RS-94-12] Glynn Winskel and Mogens Nielsen. *Models for Concurrency*. May 1994, 144 pp. To appear as a chapter in the *Handbook of Logic and the Foundations of Computer Science*, Oxford University Press.

[RS-94-13] Glynn Winskel. *Stable Bistructure Models of PCF*. May 1994, 26 pp. *Preliminary draft*. Invited lecture for MFCS '94. To appear in the proceedings of MFCS '94, LNCS, 1994.

[RS-94-14] Nils Klarlund. *The Limit View of Infinite Computations*. May 1994, 16 pp. To appear in the LNCS proceedings of Concur '94, LNCS, 1994.

[RS-94-15] Mogens Nielsen and Glynn Winskel. *Petri Nets and Bisimulations*. May 1994, 36 pp.

[RS-94-16] Lars Arge. *External-Storage Data Structures for Plane-Sweep Algorithms*. June 1994, 37 pp.

[RS-94-17] Allan Cheng. *Local Model Checking and Traces*. June 1994, 30 pp.

[RS-94-18] Sten Agerholm. *LCF Examples in HOL*. June 1994, 16 pp. To appear in: *Proceedings of the 7th International Workshop on Higher Order Logic Theorem Proving and its Applications*, LNCS, 1994.

[RS-94-19] Jens Chr. Godskesen, Kim G. Larsen, and Arne Skou. *Automatic Verification of Real–Timed Systems Using* EPSILON. June 1994, 8 pp. Appears in: Protocols, Specification, Testing and Verification PSTV '94.

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ISSN 0909-3206

[NS-94-1] Peter D. Mosses, editor. *Proc. 1st International Workshop on Action Semantics* (Edinburgh, 14 April, 1994), number NS-94-1 in BRICS Notes Series, Department of Computer Science, University of Aarhus, May 1994. BRICS.

Calendar of Events

Date	Event
6–8 Jul	SWAT '94.
8 Aug	In this week there will be various tutorial lectures in preparation for the theme workshop.
11 Aug	*David Basin*, MPI Saarbrcken; one-day course: Induction Based on Rippling and Proof Planning.
15 Aug –	Theme workshop on Complexity Theory.
17–19 Oct	Nordic Workshop on Programming Theory.
21 Nov – 2 Dec	*Andrew Pitts*, Computer Laboratory, Cambridge; around 8 lectures on: Inductive and Co-inductive Techniques in the Semantics of Functional Programs.
Jan –	'95 theme on Logic in Domain Theory.
22–26 May	TAPSOFT '95.

Address

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