MAP-I
Programa Doutoral em Informática

Program Semantics, Verification, and Construction
Approaches to Correct Software

Unidade Curricular em Teoria e Fundamentos
Theory and Foundations
(UCTF)

DI-UM, DCC-FCUP

April 14, 2008

Abstract

This text presents a UCTF ("Unidade Curricular em Teorias e Fundamentos") course in the context of the joint PhD programme (Minho, Aveiro, Porto) in Informatics (MAP-I). The team responsible for the proposal consists of lecturers and professors from the Informatics department of the University of Minho (DI-UM) and the Computer Science Department - Faculty of Science of the University of Porto (DCC-FCUP).

LECTURING TEAM

DIUM:	J. Bacelar Almeida, Maria João Frade, José Nuno Oliveira, Jorge Sousa Pinto
DCCFCUP:	Sabine Broda, Luís Damas, Mário Florido, Nelma Moreira

1 Course Description

1.1 Subject and Context

The reliability of computing systems plays an essential role in modern society, where so many areas of human activity depend on technology. The deliverables of software projects may no longer be limited to code; the ability to produce *certified code* is now crucial. Code may be certified as being *functionally correct*, or as possessing certain execution properties (for instance, a program may be certified as not trying to access unauthorised resources).

The ability to certify software in this way requires a sound knowledge of the theory of programming languages and mathematical reasoning tools, as well as acquaintance with tool-assisted techniques. Once the requirements have been identified, the challenge is to be able to formalise and prove the corresponding properties (functional, security, or safety), choosing from a number of different conceptual tools and different notions of certificate.

This course gives an overview of the theory of programming languages at an advanced level (which will help to cancel the heterogeneous backgrounds of students on these subjects) and then goes on to apply the theory to methods for obtaining correct, certified software.

The second part of the course, on Program Verification, contains material analogous to what is taught in many standard advanced-level courses on program verification, with the additional coverage of recent results and current research. The third part covers the "correct by construction" approach, such as followed in courses taught at the universities of Oxford or Nottingham. In this approach certification is an automatic byproduct of the code development process.

ACM Computing Classification System subjects covered:

- /Theory of Computation/MATHEMATICAL LOGIC AND FORMAL LANGUAGES/Mathematical Logic/

- /Theory of Computation/COMPUTATION BY ABSTRACT DEVICES/

- /Theory of Computation/LOGICS AND MEANINGS OF PROGRAMS/Semantics of Programming Languages/

- /Theory of Computation/LOGICS AND MEANINGS OF PROGRAMS/Specifying and Verifying and Reasoning about Programs/

- /Software/SOFTWARE ENGINEERING/Software/Program Verification/

1.2 Objectives

This UCTF aims

- to present in a systematic way a vast set of results in fundamental areas of Theoretical Computer Science, in particular Logic, λ-calculus, Type Theory, and Programming Language Semantics, as well as the relationships between them;

- to achieve learning outcomes in the rigorous approaches to the production of correct software, namely

    - in *Program Verification*, the activity that aims to establish that a program effectively behaves according to its specification, or that its behaviour is characterized by a set of given properties;

    - in *Mathematical Program Construction*, a method for obtaining correct programs from specifications, strongly based on *Program Calculation*.

1.3 Learning Outcomes

- To understand the relation between Intuitionistic Logic and Type Theory.

- To use languages with simple, dependent, polymorphic, or inductive types, for programming, expressing properties, or writing specifications.

- To understand the use of the operational, denotational, and axiomatic styles of semantics in different contexts.

- To use proof assistants for conducting formal proofs interactively.

- To express and prove properties of functional and imperative programs with the help of proof assistants and verification condition generators.

- To understand current trends in Program Verification techniques and approaches to the certification of program properties.

- To understand the dichotomy between specification and implementation in software design.

- To understand that software (implementations) can be calculated by solving systems of equations (specifications) as in other branches of science and engineering.

- To appreciate the calculational power of the PF-transform and of the underlying allegory of binary relations.

1.4 Syllabus

- Chapter I: Overview of Foundations (21 hours)

  1. Intuitionistic logic
  2. Natural deduction
  3. λ-calculus (terms, reduction, the Church-Rosser Theorem)
  4. Simple Types (Church versus Curry typing, normalization, extensions)
  5. The Curry-Howard isomorphism
  6. Introduction to operational semantics
  7. Domain theory (complete partial orders, continuous functions)
  8. Denotational semantics

- Chapter II: Program Verification (18 hours)

  1. Dependent Types:
     - First-order dependent types
     - Type equivalence
     - Sum types
     - The calculus of inductive constructions
     - Programming with dependent types
  2. Type-based proof assistants
     - Interactive proof development
     - Tactics and tacticals
     - Inductive data types and predicates
  3. Program correctness: specification; partial and total correctness
  4. Verification of the correctness of functional programs:
     - Extraction of the computational contents of a correctness proof
     - Using programs for structuring correction proofs
  5. Axiomatic semantics of imperative programs:
     - Assertions; semantics of assertions
     - Hoare proof rules for correctness
  6. Tool support for the specification, verification, and certification of programs:
     - Proof assistants
     - Verification condition generators
  7. Survey of alternative approaches to program verification:

- – Abstract machine-based approaches
- – Certifying compilation and proof-carrying code

- Chapter III: Program Construction (9 hours)

  1. Introduction to the mathematics of program construction
     - – The specification / implementation dichotomy. Abstract modeling.
     - – Correct by verification versus correct by construction.
  2. Description versus calculation
  3. The Point-free (PF) transform
     - – Taxonomy of binary relations; simple relations and their role in abstract modeling
     - – 'Point-free' notation and reasoning
     - – Rules of the PF-transform
     - – Categorical and allegorical foundations
  4. Universal properties and Galois connections
     - – Universal constructions and properties; natural properties
     - – Reynolds' relation and the free-theorem of polymorphism
     - – Galois connections and their corollaries
  5. Reasoning by PF-calculation
     - – PF-calculation of the consistency of a formal model: satisfiability and invariance
     - – Data-level calculation: representing and abstracting data models.
  6. Inductive program calculation
     - – Relational hylomorphisms
     - – Fixpoint calculus and Galois connections: the fixpoint fusion theorem
     - – Calculating recursive solutions for hylo-equations
  7. Open issues and hot topics in the mathematics of program construction

1.5 Teaching Methods

- Lectures

- Occasional tool demonstration / case study sessions

1.6 Student Assessment

- Examinations

- Research assignments, which may include a talk given on a suggested paper, or practical assignments

1.7 Recommended Books

[1] Samson Abramsky and Achim Jung. Domain theory. In *Handbook of Logic in Computer Science (vol. 3): Semantic Structures*, pages 1–168. Oxford University Press, Oxford, UK, 1994.

[2] Roland C. Backhouse. *Program construction and verification*. Prentice-Hall, Inc., Upper Saddle River, NJ, USA, 1986.

[3] Henk P. Barendregt. *The Lambda Calculus: Its Syntax and Semantics*, volume 103 of *Studies in Logic and the Foundations of Mathematics*. North-Holland Publishing Company, second, revised edition, 1984.

[4] Henk P. Barendregt. Lambda calculi with types. In S. Abramsky, D. Gabbay, and T. S. E. Maibaum, editors, *Handbook of Logic in Computer Science*, volume 2, chapter 2, pages 117–309. Oxford University Press, 1992.

[5] Yves Bertot and Pierre Casteran. *Interactive Theorem Proving and Program Development*. Springer Verlag, 2004.

[6] Richard Bird and Oege de Moor. *Algebra of Programming*. Prentice Hall, 1997.

[7] Jean-Yves Girard, Yves Lafont, and Paul Taylor. *Proofs and Types*, volume 7 of *Cambridge Tracts in Theoretical Computer Science*. Cambridge University Press, 1989.

[8] M. Hennessy. *The Semantics of Programming Languages*. Wiley, 1990.

[9] H. R. Nielson and F. Nielson. *Semantics with Applications : A Formal Introduction*. Wiley, 1992.

[10] Glynn Winskel. *The Formal Semantics of Programming Languages: An introduction*. Foundations of Computing. The MIT Press, Cambridge, Massachusetts, 1993.

2 Lecturing Team

The team consists of members of the Department of Informatics of the University of Minho and the Department of Computer Science of the University of Porto (Faculty of Science).

All team members are working, and have worked actively in the past few years, on topics that are directly related to the subjects covered by this course, as detailed below.

- José Bacelar Almeida (DI-UM) has worked on the verification of security protocols, and has experience in using proof-assistants for program development.

- Sabine Broda (DCC-FCUP) has worked on Mathematical Logic, λ-calculus, and Type Theory.

- Luís Damas (DCC-FCUP) has worked extensively on λ-calculus and Type Theory; he is in fact responsible for the introduction of many of these subjects in Portugal.

- Mário Florido (DCC-FCUP) has worked on λ-calculus, type systems, and program transformation.

- Maria J. Frade (DI-UM) has worked on λ-calculus, type systems, and Proof Theory.

- Nelma Moreira (DCC-FCUP) has worked on Automata Theory, Proof Theory, and proof assistants.

- José N. Oliveira (DI-UM) has worked extensively on Formal Methods in Software Engineering and is in fact a pioneer of this area in Portugal. Recently he has become interested in the calculation-based approach to program construction.

- Jorge Sousa Pinto (DI-UM) has worked on Linear Logic, λ-calculus, and functional program transformation.

Moreover, this team sucessfully submitted a joint research project proposal on Program Verification and Proof-carrying Code, together with colleagues from other departments. One of the purposes of the RESCUE project is to allow to set up a lasting scientific network in the area of Program Verification. Several PhD students have now started to work on themes directly related to this UCTF.

Curriculum Vitæ

Janeiro 2007

Dados Pessoais

Nome:	**José Carlos Bacelar Almeida**
Data de nascimento:	6 de Março de 1969
Endereço:	Departamento de Informática
	Campus Universitário de Gualtar
	4710-057 Braga
	Portugal
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Fax:	+351 253 604471
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Habilitações Académicas

- *Doutoramento em Informática - Área de Conhecimento de Fundamentos da Computação*, na Universidade do Minho (2003).

- *Mestrado em Informática - Ramo de Ciências de Computação*, na Universidade do Minho (1994).

- *Licenciatura em Engenharia Electrotécnica e de Computadores*, Universidade do Porto (1991).

Carreira Profissional

(Desde Junho de 2003) Professora Auxilar no Departamento de Informática da Universidade do Minho, no grupo disciplinar de Lógica e Métodos Formais.

(Jan. de 1994 a Junho de 2003) Assistente no Departamento de Informática da Universidade do Minho, no grupo disciplinar de Lógica e Métodos Formais.

(Dez. de 1992 a Jan. de 1994) Assistente Estagiária no Departamento de Informática da Universidade do Minho, no grupo disciplinar de Fundamentos da Computação.

Actividade Científica

Investigadora do *Centro de Ciência e Tecnologia da Computação (CCTC)*, da Escola de Engenharia da Universidade do Minho.

Envolvimento em Projectos de I&D

1. PURe - Program Understanding and Re-engineering (POSI/ICHS/44304/2002)

2. TYPES - Types for Proofs and Programs (FP6-2002-IST-C 510996)

3. APPSEM II - Applied Semmantics II (The IST Programme - IST-2001-38957)

4. TYPES Working Group (The IST Programme - IST-2000-29001)

5. FACS - Foundations and Applications of Constructor Subtyping (Praxis XXI/C/EEI/14172/98)

6. LOGCOMP - Logic and Computation (Praxis XXI Project 2/2.1/TIT/1658/95)

Publicações

1. José Bacelar Almeida, Jorge Sousa Pinto, Miguel Vilaça. *A Local Graph-Rewriting System for Deciding Equality in Sum-product Theories.* In *Termgraph 2006.* Electronic Notes in Theoretical Computer Science (to appear).

2. José Bacelar Almeida, Paulo Sérgio Almeida, Carlos Baquero. Bounded Version Vectors.In *Proceedings of DISC 2004*: International Symposium of Distributed Computing. LNCS 3274, Springer-Verlag 2004.

3. José Bacelar Almeida. *Verificação Automática de Protocolos Criptográficos.* Universidade do Minho, 2003. Tese de Doutoramento.

4. José Bacelar Almeida. *Cryptographic Algorithms Formalized in COQ.* COQ Workshop, Formal Methods Europe, Tolouse, France. September 1999.

5. José Bacelar Almeida. *A Componente Estrutural do Sistema O.* Tese de mestrado, ramo de Ciências da Computação. Universidade do Minho, 1994.

Organização de Reuniões Científicas

1. Membro da comissão organizadora da *"Summer School on Generative and Transformational Techniques in Software Engineering"* que decorreu de 4 a 8 de Julho de 2005, em Braga.

2. Membro da comissão organizadora da *"International Summer School on Applied Semantics"* que decorreu de 9 a 15 de Setembro de 2000, em Caminha.

3. Membro da comissão organizadora da *"Third International Summer School on Advanced Funcional Programming"* que decorreu de 12 a 19 de Setembro de 1998, na Universidade do Minho.

Curriculum Vitae

Sabine Broda

Address

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Personal Details

Date of birth: 26th of January, 1964
Place of birth: Recklinghausen, Germany
Nationality: PORTUGAL

ACADEMIC DEGREES

1997	PhD in Computer Science, University of Porto
1987	Degree in Applied Mathematics, University of Porto

ACADEMIC POSITIONS

2001-	Associate Professor, Department of Computer Science, Faculty of Science, University of Porto
1997-2001	Auxiliar Professor, Department of Computer Science, Faculty of Science, University of Porto
1996-1997	Assistant, Department of Computer Science, Faculty of Science, University of Porto
1987-1996	Assistant, Department of Pure Mathematics, Faculty of Science, University of Porto

PRESENT RESEARCH INTERESTS

Mathematical logic; particularly lambda-calculus, combinatory logic and type-theory.

SUPERVISING EXPERIENCE

1997-1998   *Implementação de uma Linguagem Funcional usando Combinadores Compactos*, Pedro Vasconcelos, Master Thesis, in co-supervision with Luís Damas.

PARTICIPATION IN RESEARCH PROJECTS

- Project *CORE: Sistemas Formais e Complexidade Computacional*, (Praxis XXI/P/EEI/ 14233/1998), 1999-2001.

- Project *PROLOPPE*, (Praxis XXI, contract 3/3.1/TIT/24/94), 1995-1998.

- Project *Constraint Logic Grammars*, Universidade do Porto and CCE, 1989-1993.

- Project *Implementaçãoo de Linguagens de Programaçãoo em Lógica*, integrated in *Linguagens e Programação em Lógica* of CIUP-INIC, 1988-1993.

THESES

1997   *Sobre bases de combinadores para sistemas de lambda-calculus*, PhD Thesis, University of Porto

1991   *Semântica da Programação em Lógica incluindo Restrições*, Provas de Aptidão Pedagógica e Capacidade Científica, University of Porto

PAPERS IN INTERNATIONAL SCIENTIFIC PERIODICALS WITH REFEREES

2005   S. Broda, L. Damas, Inhabitation of simple types, Journal of Logic and Computation, 15(3): 353-390

2004   S. Broda, L. Damas, M. Finger, P. Silva e Silva, The Decidability of a Fragment of $BBIW$-logic. Journal of Theoretical Computer Science 318, pp. 373-408

2002   S. Broda, L. Damas, Studying provability in implicational intuitionistic logic: the formula tree approach. Electronic Notes in Theoretical Computer Science (Elsevier), Volume

	67, Proceedings of the 9th Workshop on Logic, Language, Information and Computation (WoLLICt'2002)
2001	S. Broda, L. Damas, Counting a typet's (principal) inhabitants. Fundamenta Informaticae 45, pp. 33-51
2001	S. Broda, L. Damas, A context-free grammar representation for normal inhabitants of types in TA-lambda. Proceedings of the 10th Portuguese Conference on Artificial Intelligence. LNAI 2258, pp. 321-334
2000	S. Broda, L. Damas, On principal types of combinators. Journal of Theoretical Computer Science 247 (1-2), pp. 277-290, 2000
1999	S. Broda, L. Damas, Counting a typet's principal inhabitants. Proceedings of the 4th International Conference on Typed Lambda Calculi and Applications. LNCS 1581, pp. 69-82
1997	S. Broda, L. Damas, On combinatory complete sets of proper combinators. Journal of Functional Programming 7 (6), pp. 593-612
1997	S. Broda, L. Damas, Compact bracket abstraction in combinatory logic. Journal of Symbolic Logic 62 (3), pp. 729-740
1995	S. Broda, L. Damas, A new translation algorithm from Lambda Calculus into Combinatory Logic. Proceedings of the 7th Portuguese Conference on Artificial Intelligence. LNAI 990, pp. 359-370, 1995
1993	L. Damas, N. Moreira, S. Broda, Resolution of constraints in algebras of rational trees. Proceedings of the 6th Portuguese Conference on Artificial Intelligence. LNAI 727, pp. 61-76

Porto, January 19, 2007

Curriculum Vitae

Mário Florido

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Homepage:`http://www.ncc.up.pt/~amf`

Personal data

Birth date: 2/11/1966
Birth place: Bragança
Nationality: PORTUGAL

Academic degrees

1998	PhD. in Computer Science, Universidade do Porto.
1991	MSc-FAIT, Imperial College, University of London.
1989	Degree in Applied Mathematics-Computer Science, FCUP.

Academic positions

2005-	Professor Associado, DCC-FC, Universidade do Porto.
1998-2005	Professor Auxiliar, DCC-FC, Universidade do Porto
1995-1997	Assistente, DI, Universidade do Minho.
1993-1995	Assistente, DM-Universidade Lusíada
1988-1990	Monitor, DMA FC-Universidade do Porto

Present research interests

Lambda Calculus
Type Theory
Program Verification

Semi-structured data (XML) processing

MASTER THESES SUPERVISION

2001	Inferência de Tipos usando Resolução de Restrições, por Sandra Alves. Mestrado em Informática da Faculdade de Ciências da Universidade do Porto (aprovada com Muito Bom)
2002	Processamento de XML em Programação em Lógica, por Jorge Coelho. Mestrado em Informática da Faculdade de Ciências da Universidade do Porto (aprovada com Muito Bom)

PhD THESES SUPERVISION

since 2001	Sandra Alves. Subject: Type Inference and program transformation.
since 2003	Jorge Coelho. Subject: Semi-structered data processing.
since 2004	Hugo Simões. Subject: Programming languages and implicit complexity.

PARTICIPATION IN RESEARCH PROJECTS

1994	PROLOPPE: Programação em Lógica Paralela com Extensões. (contrato Praxis 3.3.1/TIT/24/94) (membro da equipa)
1998	GANESH: Um ambiente modular e distribuido para aprendizagem de Ciência de Computadores (contrato PRAXIS, 14232/98)(membro da equipa)
1998	CORE: Sistemas Formais e Complexidade Computacional (contrato PRAXIS, 14233/98) (membro da equipa)
2004	Sistemas de tipos e efeitos para análise de custos de programas funcionais. Acção integrada Luso-Britânica, CRUP-British Council, n. B-14/04, 2004. (membro da equipa)
2006	Linearity: Programming Languages and Implementations. Acção integrada Luso-Britânica, CRUP-British Council, n. B-14/04, 2005-2006. (responsável pelo grupo português)

PUBLICATIONS

Thesis

1. Mário Florido, Sistemas de Tipos para Linguagens Declarativas. Tese de doutoramento, Universidade do Porto, 1998.

2. Mário Florido, A Constraint Solver for IC-Prolog II. M.Sc. Thesis, Imperial College, University of London, 1991.

Papers in international scientific periodicals with referees

1. Mário Florido and Luís Damas. Linearization of the Lambda-Calculus and its Relation with Intersection Type Systems. Journal of Functional Programming,Cambridge University Press, vol 14, 2004.

2. Sandra Alves and Mário Florido. Weak Linearization of the Lambda-Calculus. Theoretical Computer Science (TCS), 342(1):79-103, Elsevier Science, September 2005.

Papers in conference proceedings

1. Sandra Alves and Mário Florido. Linearization by Program Transformation. Selected and Revised papers of the International Symposium on Logic-based Program Synthesis and Transformation (LOPSTR 2003), LNCS Springer Verlag, 2004.

2. Sandra Alves and Mário Florido. Linearization by Program Transformation. 2nd Applied Semantics Workshop (APPSEM II), Estonia, 2004.

3. Hugo Simões and Mário Florido. TypeTool: A Type Inference Visualization Tool. 13th International Workshop on Functional and (Constraint) Logic Programming (WFLP 2004), Germany 2004.

4. Jorge Coelho and Mário Florido. Type-based XML Processing in Logic Programming. International Symposium on Practical Aspects of Declarative Languages (PADL´03), LNCS 2562, 2003.

5. Sandra Alves and Mário Florido. Type Inference using Constraint Handling Rules. Eletronic Notes in Theoretical Computer Science (ENTCS), vol 64, 2002.

6. Sandra Alves and Mário Florido. On the Relation between Rank 2 Intersection Types and Simple Types. Joint Conference on Declarative Programming (AGP´2002), 2002.

7. Mário Florido and L. Damas, Type Constraints as a semantic characterization of type systems. In Fourth International Workshop on Set Constraints and Constraint-based Program Analysis, Italy 1998.

8. Mário Florido and L. Damas, Types as theories. In Proceedings of the JICSLP´92 Workshop on Proofs and Types, 1992.

9. Jorge Coelho e Mário Florido. VeriFLog: A Constraint Logic Programming Approach to Verification of Website Content. International Workshop on XML Research and Applications (XRA 2006). LNCS 3842, Springer Verlag. 2006.

10. Jorge Coelho and Mário Florido. XML Processing and Logic Programming. XML Applications and Associated Technologies (XATA 2005), Braga, Portugal, 2005, pp 240-252, ISBN 972-99166-1-6.

11. Jorge Coelho and Mário Florido. CLP(Flex): Constraint Logic Programming Applied to XML Processing. International Conference on Ontologies, DataBases, and Applications of Semantics (ODBASE 2004), LNCS 3291, 2004.

12. Sandra Alves, Maribel Fernandez, Mario Florido and Ian Mackie. The power of linear functions. In Proc. of the Conference Computer Science Logic (CSL), LNCS Springer Verlag, 2006.

13. Sandra Alves, Maribel Fernandez, Mario Florido, and Ian Mackie. The Power of Closed Reduction Strategies. In Proc of the Sixth International Workshop on Reduction Strategies in Rewriting and Programming (WRS), ENTCS Elsevier Science, 2006.

14. Jorge Coelho and Mário Florido. Unification with Flexible Arity Symbols: a Typed Approach. In Proc. of the 20th International Workshop on Unification (UNIF), 2006.

15. Hugo Simões, Kevin Hammond, Mario Florido and Pedro Vasconcelos, Intersection Types for Cost-analysis of Functional Programs. TYPES 2006, LNCS Springer-Verlag, 2006.

16. Sandra Alves, Maribel Fernandez, Mário Florido and Ian Mackie. Iterator Types. Foundations of Software Science and Computation Structures (FOSSACS 2007), LNCS Springer, 2007 (to appear).

Other publications

1. Sandra Alves and Mário Florido. The Weak Linear Lambda-Calculus. Contributed talk on the meeting Days in Logic, Braga 2004.

2. Mário Florido and Luís Damas, Intersection Types and the Linear Lambda-Calculus. Technical Report DCC-2001-9, DCC-FC, LIACC, Universidade do Porto, 2001.

3. Mário Florido and L. Damas, Semantic Types. Laboratório de Inteligência Artificial e Ciência de Computadores, Universidade do Porto, 1994.

4. Miguel Filgueiras, A. P. Tomás, J. P. Leal, and A. M. Florido, A Prolog Screen Controller Driven by High-level Descriptions of Interactions. Centro de Informática, Universidade do Porto, 1990.

5. Jorge Coelho and Mário Florido. CLP(Flex): Constraint logic programming applied to XML processing. Technical report, DCC-FC, LIACC. University of Porto, 2004.

6. Mário Florido, Type-based linearization of the lambda-calculus. Meeting : Days in Logic, Coimbra, Portugal, 2006.

7. Sandra Alves and Mário Florido, Linearização Fraca do Lambda-Calculus. Presented at Jornadas de Ciências da Computação (JCC), Porto, Portugal, 2006.

Oral communications

1. Programação por Restrições nos Reais, palestra na Universidade do Porto, 1991.

2. Semântica de Linguagens de Programação em Lógica, palestra na Universidade do Porto, 1992.

3. Redes de Interacção. Palestra no LIACC, Universidade do Porto, 1998.

4. O sistema de tipos simples. Palestra no LIACC, Universidade do Porto, 2000.

5. Type Constraints as a semantic characterization of type systems. In Fourth International Workshop on Set Constraints and Constraint-based Program Analysis, Pisa, Italy, 1998.

6. Types as theories. Workshop on Proofs and Types, Washington, USA, 1992. Type-Based Linearization of the Lambda-Calculus. Talk in the meeting Days in Logic, Coimbra, Portugal, 2006.

7. Linearização Fraca do Lambda-Calculus. Jornada de Ciências da Computação (JCC), Porto, Portugal, 2006.

Porto, 20 de Janeiro de 2007

**Europass
Curriculum Vitae**

Personal information

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Nationality(-ies)	Portuguese
Date of birth	30, May, 1968

Work experience

• Aux. Prof.	*Dates*: since 2004 *Employer*: University of Minho, Portugal *Sector*: Dept. of Informatics *Position held*: Auxiliary Professor *Main activities*: teaching & research
• Lecturer	*Dates*: 1995-04 *Employer*: University of Minho, Portugal *Sector*: Dept. of Informatics *Position held*: Lecturer *Main activities*: teaching & research
• Assist. Lecturer	*Dates*: 1992-95 *Employer*: University of Minho, Portugal *Sector*: Dept. of Informatics *Position held*: Assistant lecturer *Main activities*: teaching & research

Education and training

• Ph.D.	*Year*: 2004 *Academic degree*: Philosophy Doctor *Institution*: Dept. of Informatics, University of Minho, Portugal
• M.Sc.	*Year*: 1995 *Academic degree*: Master of Science *Institution*: Dept. of Informatics, University of Minho, Portugal
• Lic.	*Year*: 1991 *Academic degree*: *Licenciatura* *Institution*: Dept. of Informatics, University of Minho, Portugal

Technical skills

• Domain of specialization	Computer science

• Areas of research	Type theory, semantics of programming languages, functional programming

Program committees

COMMITTEE MEMBER

• GTTSE 2005	*Summer School on Generative and Transformational Techniques in Software Engineering*, 4 - 8 July, 2005, Braga, Portugal
• APPSEM 2000	*International Summer School On Applied Semantics*, 9 - 15 September 2000, Caminha, Portugal
• AFP 98	*Third International Summer School on Advanced Funcional Programming*, 12 - 19 September, 1998, Braga, Portugal

Participation in research projects

• CACE	CACE - Computer Aided Cryptography Engineering (FP7 project funded by the European Union.)
• RESCUE	RESCUE - REliable and Safe Code execUtion for Embedded systems (FCT under contract PTDC/EIA/65862/2006)
• TYPES	TYPES - Types for Proofs and Programs (FP6-2002-IST-C 510996)
• APPSEM II	APPSEM II - Applied Semmantics II (The IST Programme - IST-2001-38957)
• TYPES	TYPES Working Group (The IST Programme - IST-2000-29001)
• FACS	Foundations and Applications of Constructor Subtyping (Praxis XXI/C/EEI/14172/98)
• LogComp	Logic and Computation (Praxis XXI Project 2/2.1/TIT/1658/95)

Publications

BOOKS OR BOOK CHAPTERS

• SFP06	José Espírito Santo, Maria João Frade, and Luis Pinto. Structural proof theory as rewriting. In Frank Pfenning, editor, *RTA*, volume 4098 of *Lecture Notes in Computer Science*, pages 197–211. Springer, 2006
• BF99	Gilles Barthe and Maria João Frade. Constructor subtyping. In S. Doaitse Swierstra, editor, *ESOP*, volume 1576 of *Lecture Notes in Computer Science*, pages 109–127. Springer, 1999

INTERNATIONAL JOURNALS

• BFGPU04	Gilles Barthe, Maria João Frade, E. Giménez, Luis Pinto, and Tarmo Uustalu. Type-based termination of recursive definitions. *Mathematical Structures in Computer Science*, 14(1):97–141, 2004

INTERNATIONAL CONFERENCES

• FSU07	Maria João Frade, Ando Saabas, and Tarmo Uustalu.
	Foundational certification of data-flow analyses.
	In *First Joint IEEE/IFIP Symposium on Theoretical Aspects of Software Engineering (TASE '07)*, pages 107–116. IEEE CS Press, 2007

THESES AND DISSERTATIONS

• Fr04	Maria João Frade.
	Type-Based Termination of Recursive Definitions and Constructor Subtyping in Typed Lambda Calculi.
	PhD thesis, Dept. of Informatics, University of Minho, March 2004
• Fr95	Maria João Frade.
	Comportamento e estado.
	Master's thesis, Dept. of Informatics, University of Minho, January 1995

Personal skills and competences

| • Mother tongue | Portuguese |
| • Other languages | English |

CURRICULUM VITAE

NELMA MOREIRA

ADDRESS

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PERSONAL DATA

Birth date: 4/06/1961
Birth place: France
Nationality: PORTUGAL

ACADEMIC DEGREES

1997	Doutoramento Ciência de Computadores, Universidade do Porto.
1989	Provas de Aptidão Pedagógica e Capacidade Científica, Universidade do Porto, com a classificação de Muito Bom.
1984	Licenciatura em Matemática da Faculdade de Ciências da Universidade do Porto, ramo de Matemática Aplicada, média final de 15 valores.
1978	Curso Complementar dos Liceus com a classificação média de 16 valores, no Liceu Carolina Michaellis.

ACADEMIC POSITIONS

1997-	Professora Auxiliar no Departamento de Ciência de Computadores da F.C.U.P.
1996-1997	Assistente no Departamento de Ciência de Computadores da F.C.U.P.
1989–1996	Assistente no Grupo de Matemática Aplicada da F.C.U.P., na área de Ciência de Computadores.

1984-1989	Assistente Estagiária no Grupo de Matemática Aplicada da Faculdade de Ciências da Universidade do Porto (F.C.U.P.), na área de Ciência de Computadores.
1983-1984	Professora na Escola Secundária de Oliveira Martins, Porto.

PRESENT RESEARCH INTERESTS

Automata Theory and formal languages
Symbolic constraint programming
Interactive proof assistants and program verification
Structural proof Theory and substructural logics
Semi-structured documents

DIPLOMA THESIS SUPERVISION

2006	*Ferramentas para geração e enumeração de linguagens regulares*, by Marco Almeida.
2005	*Ferramentas WEB para acesso a um thesaurus*, by Marina Sofia Campos Sousa.
2005	*Interface gráfico para a edição e a visualização de autómatos finitos*, by Vera João.
2004	*Sistema de informação para a gestão de pessoas e actividades da UPP*, by Vitor Hugo Lopes Félix.
2003	*Automatic: editor de diagramas de autómatos finitos*, Pedro Ângelo.
2001	*Desenvolvimento Centro de Informação da Universidade Popular do Porto*, by Luís Pessoa.
1998	*Gestão da base de dados da biblioteca do CIUP (DCC e LIACC)*, by Raquel Maria Castro da Silva.

MASTER THESES SUPERVISION

- *Obtenção de expressões regulares pequenas a partir de autómatos finitos*, José João Gonçalves Morais, Mestrado em Informática, Faculdade de Ciências da Universidade do Porto,01/2005 (Co-supervision with Rogério Reis)

- *GerExa: uma plataforma para a manipulação de exercicios e exames em XML*. Ângela Oliveira, Mestrado em Informática, Faculdade de Ciências da Universidade do Porto. 12/2006.

- *Specification of a Language for Timetabling Problems*, Dora Melo, Mestrado em Informática, Faculdade de Ciências da Universidade do Porto,12/2006. (Co-supervision with João Pedro Pedroso and Rogério Reis)

- *Logic frameworks for reasoning about emotions in BDI Agents.* David Pereira, Mestrado em Informática. (Co-supervision with Eugénio Oliveira)

PARTICIPATION IN RESEARCH PROJECTS

Team member of the following projects:

- Project "Memórias do Trabalho", Project POCI/CED/60786/2004 funded by Fundação para a Ciência e Tecnologia , (2006-2008)

- Project AGILMAT - Automatic Generation of Interactive Drills for Mathematics Learning, Project POSI/CHS/48565/2002, funded by Fundação para a Ciência e Tecnologia , POSI and FEDER. (2003-2006)

- Project 'Memórias e Vivências de Trabalhadores Têxteis do Porto - Condições de Vida e de Trabalho na Indústria Têxtil´, integrado no programa "Investigação Científica na pré-graduação´´ da Universidade do Porto, 2005.

- Project "CORE: Sistemas Formais e Complexidade Computacional", 1999-2001, FCT.

- Project "Ganesh: Ambiente Modular e Distribuído de Ensino de Ciência de Computadores"1999-2001, FCT.

- Project "PROLOPPE: Programação em Lógica Paralela com Extensões", do LIACC e CENTRIA (U.N.L), aprovado pela JNICT (contrato Praxis 3/3.1/TIT/24/94) no âmbito do Programa Base de Investigação Científica e Tecnológica.

- Project "Constraint Logic Grammars"da Universidade do Porto e CCE (1989-1991)

- Project "Eurotra"da Comissão das Comunidades Europeias (CCE)-1988–1990

- Project "Interfaces Naturais para Acesso a Bases de Dados", F.C.U.P e INESC-Norte, 1987/1988.

- Project "Processamento de Linguagem Natural"da Linha de Acção 4 (Linguagens e Programação Lógica) do Centro de Informática da Universidade do Porto - INIC, de Maio de 1988 a 1989.

PUBLICATIONS

Thesis

1. Restrições Complexaas sobre Álgebras de Árvores e Aplicação a Gramáticas Lógicas. PhD thesis, Universidade do Porto, 1997.

3

2. Representação de semântica de referências temporais em linguagem natural. Masterś thesis, Universidade do Porto, Outubro 1988. Apresentado à Universidade do Porto no âmbito das Provas de Aptidão Pedagógica e Capacidade Científica.

Books (editor)

Natural Language Processing, EAIA 90. LNAI 476, Springer-Verlag.1991 (with M. Filgueiras, L.Damas and A.P.Tomás eds)

Chapters in books

1. The formal and computational theory of complex constraint solution. In C. Rupp, M. A. Rosner, and R. L. Johnson, editors, Constraints, Language, and Computation, Computation in Cognitive Science, pages 149-166. Academic Press, London, 1994.(with Luis Damas and Giovanni Varile)

2. Miguel Filgueiras, N. Moreira, and A. P. Tomás, General introduction. In M. Filgueiras et al. (eds.), Natural Language Processing – EAIA'90 Proceedings. Lecture Notes in Artificial Intelligence, 476, 1-3, ©Springer-Verlag, 1991.

Papers in international scientific periodicals with referees

1. Nelma Moreira and Rogério Reis, On the density of languages representing finite set partitions. Journal of Integer Sequences, 8, 05.2.8, 2005. MR2152288 (Math Reviews).

Papers in conference proceedings

1. David Pereira, Eugénio Oliveira, and Nelma Moreira. Modelling emotional bdi agents. In Workshop on Formal Approaches to Multi-Agent Systems (FAMAS 2006), Riva del Garda, Italy, 2006.

2. Marco Almeida, Nelma Moreira, and Rogério Reis. Aspects of enumeration and generation with a string automata representation. In H. Leung and G.Pighizzini, editors, Proceedings of the 8th Int. Workshop on Descriptional Complexity of Formal Systems (DCFS06), Computer Science Technical Report NMSU-CS-2006-001, pages 58-69, Las Cruces, New Mexico, June 2006. NMSU.

3. Ana Paula Tomás, Nelma Moreira, Nuno Pereira. Designing a Solver for Arithmetic Constraints to Support Education in Mathematics. IFIP Conference on Artificial Intelligence Applications & Innovations (AIAI) 2006 , Athens, Greece. ©Springer-Verlag

4. David Pereira, Eugénio Oliveira, Nelma Moreira and Luís Sarmento. Towards an Architecture for Emotional BDI Agents. EPIA05 – 12th Portuguese Conference on Artificial. Universidade da Beira Interior. IEEE. 2005. ISBN 0-7803-9365-1.

5. Rogério Reis, Nelma Moreira and Marco Almeida, On the Representation of Finite Automata,Proceedings of the 7th Int. Workshop on Descriptional Complexity of Formal Systems (DCFS05), C. Mereghetti, B. Palano, G. Pighizzini and D. Wotschkes,2005.

6. José João Morais, Nelma Moreira and Rogério Reis. Acyclic Automata with easy-to-find short regular expressions. Proccedings of the Tenth International Conference on Implementation and Application of Automata, CIAA 2005. pp 349-350., LNCS 3845, Springer Verlag, 2006.

7. Nelma Moreira and Rogério Reis. Interactive Manipulation of Regular Objects with FAdo. In Proceedings of 2005 Innovation and Technology in Computer Science Education (ITiCSE 2005) (and ACM Digital Library), 2005.

8. Ângela Oliveira and Nelma Moreira. GerExa: Plataforma Integrada para a Organização, Geração e Avaliação de Exercícios e Testes. In Actas da 3a Conferência Nacional XML: Aplicações e Tecnologias Associadas, Universidade do Minho, Isbn 972-99166-1-6, 2005.

9. João Pedro Pedroso and Nelma Moreira and Rogério Reis. A Web-Based System For Multi-Agent Interactive Timetabling, ICKEDS 2004, First International Conference on Knowledge Engineering and Decision Support, Porto,21-23 of July, 2004.

10. Nelma Moreira José Paulo Leal and Pedro Ribeiro. Edic: Uma abordagem para apresentação de conteúdos pedagógicos na web. In Proceedings of the International Conference on New Technologies in Science Education, CINTEC 2001, Aveiro, 2001.

11. Luís Damas and Nelma Moreira. Constraint categorial grammars. In Nuno Mamede and Carlos Pinto-Fereira, editors, Proceedings of the 7th Portuguese Conference on Artificial Intelligence (EPIA 95), volume 990 of Lecture Notes in Artificial Intelligence. Springer-Verlag, 1995.

12. Luís Damas, Nelma Moreira, and Sabine Broda. Resolution of constraints in algebras of rational trees. In Miguel Filgueiras and Luís Damas, editors, Progress in Artificial Intelligence - 6th Portuguese Conference on Artificial Intelligence (EPIA 93), volume 727 of Lecture Notes in Artificial Intelligence, pages 61-76. Springer-Verlag, 1993.

13. Luís Damas, Nelma Moreira, and Giovanni B. Varile. The formal and processing models of CLG. In Fifth Conference of the European Chapter of the Association for Computational Linguistics, pages 173-178, Berlin, 1991.

14. M. Filgueiras, A.P. Tomás, N. Moreira, J.P. Leal, and R.Reis. Natural language and natural menus interfaces. In Preprints of the TC-7 IFIP International Conference Modelling the Innovation, Roma, March 1990. Also in M. Carnevale, M. Lucertini, S. Nicosia (eds.), Modelling the Innovation: Communications, Automation and Information Systems, North-Holland, 1990.

15. Sergio Balari, Luís Damas, Nelma Moreira, and Giovanni B. Varile. CLG(n): Constraint logic grammars. In H.Karlgren, editor, Proceedings of the 13th International Conference on Computational Linguistics (COLING), volume 3, pages 7-12, Helsinki, 1990.

16. Nelma Moreira. Semantic analysis of time and tense in natural language: an implementation. In J.P Martins and E.M. Morgado, editors, Proceedings of the 4th Portuguese Conference of Artificial Inteligence, number 390 in LNAI, Berlin, 1989. Springer-Verlag.

17. Isabel Labouriau e Nelma Moreira. Soluções periódicas das equações de Fitzhugh para o impulso nervoso. In Actas do VII Congresso do Grupo de Matemáticos de Expressão Latina, 1985.

Other publications

1. Ana Paula Tomás, Nelma Moreira, Nuno Pereira. Designing a Symbolic Solver for Arithmetic Constraints to Support Education in Mathematics DCC - FC & LIACC, Universidade do Porto, August 2005.

2. Nelma Moreira and Rogério Reis. FAdo:Interactive Tools for Learning Formal Computational Models. Actas do Encontro Nacional de Visualização Científica 2005. Centro Multimeios de Espinho.

3. José João Morais, Nelma Moreira and Rogério Reis. Acyclic Automata with easy-to-find short regular expressions. Technical Report DCC-2005-03,DCC-FC& LIACC, Universidade do Porto, April 2005.

4. Marco Almeida, Nelma Moreira and Rogério Reis. On the Representation of Finite Automata, Technical Report DCC-2005-04, DCC - FC & LIACC, Universidade do Porto, April, 2005.

5. Rogério Reis and Nelma Moreira and João Pedro Pedroso. Educated brute-force to get h(4). Technical report DCC-2004-04, DCC-FC & LIACC, Universidade do Porto, 2004.

6. Rogério Reis and Nelma Moreira. Fado:tools for finite automata and regular expressions manipulation. Technical Report DCC-2002-2, DCC-FC& LIACC, Universidade do Porto, August 2002.

7. Rogério Reis and Nelma Moreira. Apoo: an environment for a firts course in assembly language programming. SIGCSE Bulletin (ACM Special Interest Group on Computer Science Education), 33(2), December 2001.

8. José Paulo Leal and Nelma Moreira. Using matching for automatic assessment in computer science learning environments. In Francisco Restivo and Lígia Ribeiro, editors, Web-Based Lerning Environments. Merlin 2000 Project, FEUP, June 2000.

9. José Paulo Leal and Nelma Moreira. Using matching for automatic assessment in computer science learning environments. Technical Report DCC-2000-3, DCC - FC & LIACC, Universidade do Porto, 2000.

10. José Paulo Leal and Nelma Moreira. Automatic grading of programming exercises. Technical Report DCC-98-4, DCC - FC & LIACC, Universidade do Porto, 1998.

11. Luís Damas and Nelma Moreira. CCLG: Constraint categorial grammars. In Rolf Backofen, Hans-Ulrich Krieger, S. Spackman, and Hans Uszkoreit, editors, Report of the EAGLES Workshop on Implemented Formalisms at DFKI, pages 26-28. DFKI, Saarbrücken, March 1993.

12. Luís Damas, Nelma Moreira, and Giovanni Varile. CLG: Constraint logic grammar. In Rolf Backofen, Hans-Ulrich Krieger, S. Spackman, and Hans Uszkoreit, editors, Report of the EAGLES Workshop on Implemented Formalisms at DFKI, pages 40-41. DFKI, Saarbrücken, March 1993.

13. Luís Damas and Nelma Moreira. A quantifier elimination algorithm for a first order logic with equality. Technical report, Centro de Informática da Universidade do Porto, July 1991.

14. José Paulo Leal, Luís Damas, and Nelma Moreira. A history based interface. In Proceedings of the ICLP preconference Workshop on Logic Programming Environments, Paris, 1991.

15. Isabel Labouriau and Nelma Moreira. Third order derivative of degenerate Hopf bifurcation in normal form. Technical report, Grupo de Matemática Aplicada da Faculdade de Ciências da Universidade do Porto, 1986.

COMMUNICATIONS

Oral communications

1. Marco Almeida, Nelma Moreira, and Rogério Reis. Aspects of enumeration and generation with a string automata representation. Workshop on Descriptional Complexity of Formal Systems (DCFS06). June 2006, Las Cruces, NM.

2. Luis Damas and Nelma Moreira. Resolution of Constraints on Trees and Higher Order Tree Descriptions. 5rd Portuguese Advanced School on AI – ¨Constraint Programming¨, Estoril, 10/1996.

3. Luís Damas and Nelma Moreira. Constraint Categorial Grammars. 7th Portuguese Conference on Artificial Intelligence, EPIA 95.

4. Luís Damas and Nelma Moreira. Constraint Categorial Grammars. European Research Conference on Logic, Language and Information: Inference and Information Structure within Computational Semantics, Espinho, 12/1994.

5. Luís Damas, Nelma Moreira, Sabine Broda. Resolution of Constraints in Algebras of Rational Trees,6th Portuguese Conference on Artificial Intelligence, 1993.

6. Nelma Moreira, Semantic Analysis of Time and Tense in Natural Language: an implementation , 4th Portuguese Conference of Artificial Intelligence, 1989.

7. Uma Forma Normal para Autómatos Finitos Determinísticos e suas Consequências, Jornada de Ciências da Computação, DCC-FCUP Junho 2006.

8. CCLG: Gramáticas de Categorias com Restrições, no Centro de Linguística da Universidade do Porto, Junho 1998.

Posters in conferences

1. José João Morais, Nelma Moreira and Rogério Reis. Acyclic Automata with easy-to-find short regular expressions (Poster)Tenth International Conference on Implementation and Application of Automata, CIAA 2005.

2. Nelma Moreira and Rogério Reis. FAdo:Interactive Tools for Learning Formal Computational Models. (Poster) Encontro Nacional de Visualização Científica, Centro Multimeios de Espinho, Portugal, 17/9/2005.

3. José Paulo Leal and Nelma Moreira. Using matching for automatic assessment in computer science learning environments. WBLE 2000, Porto Portugal.

Curriculum Vitæ[1]

1. Dados pessoais
1. Personal data
Nome completo
Full name
José Nuno Fonseca de Oliveira

Local e data de Nascimento
Birth Place and date
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Pais de Nacionalidade
Nationality
PORTUGAL

Morada
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2. Habilitações académicas
2. Academic degrees
Ano Grau académico
Year
Academic degree
Instituição
Institution
Classificação
Classification
1984 DOUTORAMENTO Dept. Computer Science, University of Manchester, UK
1981 MESTRADO Dept. Computer Science, University of Manchester
1978 LICENCIATURA Faculdade de Engenharia

3. Actividades anteriores e situação actual em termos científicos e/ou profissionais
3. Previous and current scientific and/or professional activities
Período
Period Cargo ou categoria

Position or category Instituição
Institution
since 1989 Associate Professor Universidade do Minho

1984-1989 Auxiliar Professor Universidade do Minho

1980-1984 Postgraduate student University of Manchester, Uk

1993-1997 Group leader INESC - Braga

4. Área de actividade científica
4. Area of scientific activity

Formal methods
Formal (Reverse) Specification and Program Understanding
Refinement Calculi and (Relational) Algebra of Programming
Functional Programming & Rapid Prototyping

5. Área de actividade científica
(Domínio de especialização, investigação e outras competências/actividades)
5. Area of scientific activity
(Domain of specialization, investigation interests and other skills/activities)
Domínio de especialização
Domain of specialization

Actuais interesses de investigação
Present investigation interests
Formal Methods, Functional Programming, and Software Engineering

Outras competências/actividades
Other skills/activities

6. Experiência na orientação
6. Supervising experience
Current supervision work

A. C. Paiva Pimenta (PhD, U. Porto, co-supervision with Raul Moreira Vidal and J.C. Faria) - Automated Specification-Based Testing of Graphical User Interface

C.J. Rodrigues (Ph.D, U. Minho) - Ph.D. on the foundations of the SETS reification calculus.

Paulo Filipe Araújo da Silva (Ph.D, U. Minho) - Ph.D. on Galois-connection based program calculation.

C.M. Necco (of the Universidad de San Luis, Argentina) - Ph.D. project on applying the poinfree transform to software engineering problems

Past supervision work (sample):

L.S. Barbosa (Ph.D, U. Minho) "Components as Coalgebras", 2001.

F.M. Martins (Ph.D, U. Minho) "Métodos Formais na Concepção e Desenvolvimento de Sistemas Interactivos". 1995

C.M. Necco (M.Sc., Universidad de San Luis, Argentina) "Generic Data Processing". 2005

G. Villavicencio (M.Sc., Universidad de San Luis, Argentina) "Formalization of a Reverse Engineering Strategy Based on Program Slicing". 2004

M. Rosado Cruz (M.Sc., U. Minho) "Objectificação de Especificações Formais". 2004

F.L. Neves (M.Sc., U. Minho) "Reificação "Genética" de Estruturas de Dados". 2004

M.R. Henriques (M.Sc., U. Minho) "Estudo de um Subconjunto "Preciso" do GML 2.12". 2004

L.G. Ferreira (M.Sc., U. Minho) "Formalizing Markup Languages for User Interface". 2005 (submitted)

7. Participação em projectos
7. Participation in research projects

Leader of U.Minho participation in EUREKA Project IKF (E!2235) (on-going)

Member of the R&D team of PURe - Program Understanding and Re-engineering (POSI/CHS/44304/2002) (2003-)

National R&D leader of EUREKA Project SOUR (E!379) (closed March 1995)

Leader of U.Minho participation in TEMPUS Project JEP-2692-91/1 (1991-95).

Scientific leader of R&D contract KARMA (Praxis XXI/3.1B, Consortium R&D, Id: P060-P31B-09/97) (closed 1998)

8. Prémios e Distinções
8. Prizes and awards
Ano
Year Nome do Prémio ou Distinção
Name of the prize or award Nome da entidade promotora
Name of the promoting entity
1995 Best Paper Award in Conferência Nacional Informação Multimédia na Internet, 6-8 July 1995, Braga, Universidade do Minho

9. Publicações
9. Publications
Artigos
Papers
L.S. Barbosa and J.N. Oliveira. Transposing partial components – an exercise on coalgebraic refinement. TCS 365 (2006) : 2-22

A. Cruz, L. Barbosa, and J. Oliveira. From algebras to objects: Generation and composition. Journal of Universal Computer Science, 11(10):1580-1612, 2005.

J.N. Oliveira. "Bagatelle in C arranged for VDM SoLo". Journal of Universal Computer Science, 7(8):754-781, 2001. Special Issue on Formal Aspects of Software Engineering (
Colloquium in Honor of Peter Lucas , Institute for Software Technology, Graz University of Technology, May 18-19, 2001).

T. Denvir, J.N. Oliveira, and N. Plat. "The Cash-Point (ATM) Problem". Formal Aspects of Computing, pages 211-215, 2000.

J. N. Oliveira. "A Reification Calculus for Model-Oriented Software Specification" . Formal Aspects of Computing, 2(1):1-23, April 1990.

J. N. Oliveira. "CAD Tool Extension for Formal Building Description Language", Advances in Engineering Software, Vol. 29, No. 7-9, pp. 571-586, 1998, Elsevier Science Ltd and
Civil-Comp Ltd.

Martins F.M., Oliveira J.N. Archetype-oriented User-Interfaces. Computers & Graphics, 17-28, Vol.14(1), Jan.1990.

Oliveira J.N., Wilson I.R. An Analysis of Microcomputer Implementation of Pascal. in SOFTWARE-PRACTICE & EXPERIENCE, Vol.13, 373-384, J.Wiley & Sons (1983).

Oliveira J.N. "The Formal Semantics of Deterministic Dataflow Programs". Ph.D. Thesis, Department of Computer Science, University of Manchester, February 1984.

Oliveira J.N. "Pascal on Small Microcomputers". M.Sc. Thesis, Department of Computer Science, University of Manchester, October 1981.

Livros (editor)
Books (editor)

Invited editor (with Roland Backhouse, da Univ. Nottingham, UK) of Volume 43, Ns.2-3 of "Science of Computer Programming", Elsevier, 2002.

Editor (with Pamela Zave, AT&T Laboratories Research, USA) of "Formal Methods for Increasing Software Productivity", Lecture Notes in Computer Science Nr 2021, Springer-Verlag,
2001.

Editor (with Roland Backhouse, Univ. Nottingham) of volume 1837 of Lecture Notes in Computer Science, "Mathematics of Program Construction", Springer-Verlag, 2000.

Editor (with S. Doaitse Swierstra and Pedro R. Henriques) of "Advanced Functional Programming", LNCS 1608, Springer-Verlag, 1999.

Artigos em revistas de circulação internacional com arbitragem científica
Papers in international scientific periodicals with referees

M.A. Cunha, J.N. Oliveira, J. Visser. Type-safe Two-level Data Transformation. FM'06 , LNCS 4085:284-289. Springer, 2006.

J.N. Oliveira and C.J. Rodrigues. Pointfree factorization of operation refinement. FM'06 , LNCS 4085:236-251. Springer, 2006

A. Cruz, L. Barbosa, and J. Oliveira. From algebras to objects: Generation and composition. JUCS, 11(10):1580-1612, 2005.

B. Cortes and J.N. Oliveira. Relational sampling for data quality auditing and decision support. In I. Seruca, J. Cordeiro, S. Hammoudi, and J. Filipe, editors, Enterprise
Information Systems VI . Springer, 2006. ISNB: 1-4020-3674-4.

T.L. Alves, P.F. Silva, J. Visser, J.N. Oliveira. Strategic term rewriting and its application to a VDM-SL to SQL conversion. FM'05 , LNCS 3582:399-414. Springer, 2005.

J.N. Oliveira and C.J. Rodrigues. Transposing relations: from Maybe functions to hash tables. , MPC'04 , LNCS 3125:334-356. Springer, 2004.

L. S. Barbosa and J. N. Oliveira. "State-based components made generic". In H. Peter Gumm, editor, Elect. Notes in Theor. Comp. Sci. (CMCS?03 - Workshop on Coalgebraic Methods in
Computer Science), volume 82.1, Warsaw, April 2003.

C.M. Necco and J.N. Oliveira. "Generic data processing: A normalization exercise", 2002. Presented at CACIC?02 : 8th Argentinian Computer Science Congress, Univ. Buenos Aires,
15-18th October.

L.S. Barbosa, J.N. Oliveira. Coinductive Interpreters for Process Calculi. LNCS 2441, pp. 183-197, 2002. (FLOPS 2002 - 6th International Symposium on Functional and Logic
Programming, University of Aizu, Aizu, Japan, September 15-17, 2002).

J.N. Oliveira. "On the Design of a "Periodic Table" of VDM Specifications". Invited talk at the VDM?02 workshop, held in conjunction with FME?02 in Copenhagen on 20-21 July 2002.

G. Villavicencio and J.N. Oliveira. "Formal reverse calculation supported by code slicing". In Proceedings of the Eighth Working Conference on Reverse Engineering (WCRE 2001) 2-5
October 2001, Stuttgart, Germany, pages 35-46. IEEE Computer Society, 2001.

F. L. Neves, J. C. Silva, and J. N. Oliveira. "Converting Informal Meta-data to VDM-SL: A Reverse Calculation Approach" . In VDM in Practice! A Workshop co-located with FMÕ99: The
World Congress on Formal Methods, Toulouse, France, 20-21 September, 1999.

J.J. Almeida, L.S. Barbosa, F.L. Neves, J.N. Oliveira. " CAMILA: Formal Software Engineering Supported by Functional Programming". Presented at CLaPF-97: 2nd Latin-American
Conference on Functional Programming, Oct. 3-4, La Plata, Argentina.

J.J. Almeida, L.S. Barbosa, F.L. Neves, J.N. Oliveira. " CAMILA: Prototyping and Refinement of Constructive Specifications". Presented at AMAST?97: Sixth International Conference
on Algebraic Methodology and Software Technology, 13-17 December 1997, Macquarie University, Sydney, Australia.

J. N. Oliveira. "Software Reification using the SETS Calculus" . In Proc. of the BCS FACS 5th Refinement Workshop, Theory and Practice of Formal Software Development, London, UK, pages 140-171. Springer-Verlag, 8-10 January

1992. (Invited paper).

F. L. Neves and J. N. Oliveira. "Software reuse by model reification".1995. WRIS?95 – 6th Annual Workshop on Software Reuse. August 28-30, 1995, St.Charles Il, Illinois, USA.

F. L. Neves and J. N. Oliveira. "Classifying internet objects. World Wide Web Journal", 1:711-722, November 1995. Proceedings of the Fourth International World Wide Web Conference
("The Web Revolution") December 11-14, 1995, Boston, Massachusetts, USA. Revised version of Best Paper Award in Conferência Nacional Informação Multimédia na Internet, 6-8 July
1995, Braga, Portugal.

J. N. Oliveira. "Fuzzy object comparison and its application to a self-adaptable query mechanism". In IFSA?95, volume I, pages 245-248, 22-28 July 1995. Proc. of the 6th
International Fuzzy Systems Association World Congress, S. Paulo, Brazil. Invited paper.

J.Oliveira, Araujo A. & Silva A."Historical Records Processing in the HiTeX System". In "Yesterday", 149-168, Proc. of the 6th International Conference of the Association of
History and Computing (AHC?91), Odense, Denmark, 28-30 Aug. 1991.

10. Comunicações
10. Communications
Comunicações orais por convite
Invited talks
"A software engineer's appraisal of e = m + c". Presented at SDDI'06 (DI PhD Symposium 2006), Univ.Minho, Feb. 22, 2006.

"Towards Formal Software Development in VS.NET". MSDN Seminars, 2002, May 14th (Lisbon), May 16th (Porto).

"Data processing by calculation". Invited lectures for the 6th Estonian Winter School in Computer Science, 4-9 March 2001, Palmse, Estoniia.

"Explosive" Programming Controlled by Calculation. Presented at AFP?98 , Sept., 1998, Braga, Portugal.

"Software Design by Calculation in the CAMILA Toolset",
IMADA Institute, Odense University, 3rd February 1998.

"Formal Specification, Rapid Prototyping and Program Calculation — an Industrial Experiment using the CAMILA/SETS Approach". Seminar at UNU/IIST, Macau, 6 of May 1997.

"An Experiment in CAD Tool Formal Specification". Seminar at UNU/IIST, Macau, 7 of May 1997.

"Formal Calculi Applied to Software Component Classification and Retrieving". Seminar at UNU/IIST, Macau, 9 of May 1997.

"A Calculational Approach to Reverse Specification". Seminar at UNU/IIST, Macau, 13 of May 1997.

"Can Distribution Be (Statically) Calculated?". Seminar at UNU/IIST, Macau, 16 of May 1997.

"University Education in Formal Methods - Report on the Minho Experience". in Training & Education Workshop , FME?97 , Graz, Austria, 15-19 September, 1997.

"On the Use of the Initial Algebra Approach to the Specification of Graphical Objects". 29/01/86, Cottrell Building, Computing Science Department, Univ. Stirling(UK).

11. Línguas
11. Language skills
(Vazio)
(Void)

Curriculum Vitæ

Jorge Sousa Pinto

April 10, 2008

Personal Data

Name: Jorge Miguel de Matos Sousa Pinto

Place of Birth: Porto, Portugal

Date of Birth: 25-09-1969

Nationality: Portuguese

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Academic Degrees

- *Docteur de L'École Polytechnique*, Semantics, Proofs, and Languages
  École Polytechnique, February 2001

- *Mestre*, Informatics / Computer Science
  Universidade do Minho, November 1995

- *Licenciado*, Electrical and Computer Engineering
  Universidade do Porto, September 1992

Professional Positions

Present Position: Lecturer at Universidade do Minho (Informatics Department), since February 2001

Previous Positions:

- from October 1997 to February 2001: doctorate student at École Polytechnique
- from October 1994 to September 1997: teaching assistant at Universidade do Minho

Professional Societies

– since 1992, professional member of ACM.

Grants Received

– FCT Doctorate studies grant, 1997–2001

– JNICT MSc studies grant, 1992–1994

Scientifc Areas of Interest

– Visual Models of Computation; Visual Languages; Interaction Nets

– Program Verification; Self-certifying Models

– Datatype-generic programming

– Programming Language Theory

Recent Projects

– (since January 2008) RESCUE (*REliable and Safe Code execUtion for Embedded systems*), national FCT-funded project. Participating Institutions: LIACC/DCC-FCUP, ISEP, UBI. Site leader.

– Treaty of Windsor action with King's College London, under the theme "Visual Programming", 2007.

– (since March 2005) LER (*Language Engineering and Rigorous Software Development*), EC-funded ALFA project (*Latin America Academic Training*). Project coordinator.

– APPSEM II (Applied Semantics)
5th. framework program thematic network IST-2001-38957

– (October 2003 through December 2006) PURe (Program Understanding and Re-engineering: Calculi and Applications)
FCT research project POSI/CHS/44304/2002

Students Supervised

– Luís Pedro Machado, "Pragmatic Program Verification and Transformation" (FCT funded). *Started January 2007.*

– José Miguel Vilaça, "Program Calculation and Transformation in Practice: Support Tools for a Generic Approach" (FCT funded). *Started December 2004.*

– (Co-supervised) Alcino Cunha, "Algebraic Methods for the Analyisis of Functional Programs". *Finished June 2005.*

Invited Talks and Lectures

– *Interaction Nets and Parallelism*, lecture given at the LINEAR International Summer-school, held at the S. Miguel island, Portugal, August 30th. to September 7th, 2000

Selected Publications

Journal Papers

– A. Cunha and J. S. Pinto. Point-free program calculation. *Fundamenta Informaticae*, 66(4), April-May 2005. Special Issue on Program Transformation.

– I. Mackie and J. S. Pinto. Encoding Linear Logic with Interaction Combinators. *Information and Computation*, 176(2):153–186, 2002.

Conference and Workshop Papers with Published Proceedings

– J. B. Almeida, J. S. Pinto, and M. Vilaça. A Local Graph-rewriting System for Deciding Equality in Sum-product Theories. In *Proceedings of the 3rd. International Workshop on Term Graph Rewriting (TERMGRAPH'06)*. Electronic Notes in Theoretical Computer Science 176(1), 2007.

– A. Cunha, J. S. Pinto, and J. Proença. A framework for point-free program transformation. In A. Butterfield, editor, *Revised Papers of the 17th International Workshop on Implementation and Application of Functional Languages (IFL'05)*, number 4015 in Lecture Notes in Computer Science, pages 1–18. Springer-Verlag, 2007.

– J. S. Pinto. Parallel Evaluation of Interaction Nets with MPINE. In A. Middeldorp, editor, *Proceedings of Rewriting Techniques and Applications (RTA'01)*, number 2051 in Lecture Notes in Computer Science, pages 353–356. Springer-Verlag, 2001.

– J. S. Pinto. Parallel Implementation Models for the λ-calculus Using the Geometry of Interaction (extended abstract). In S. Abramsky, editor, *Proceedings of Typed Lambda Calculi and Applications (TLCA'01)*, number 2044 in Lecture Notes in Computer Science, pages 385–399. Springer-Verlag, 2001.

– J. S. Pinto. Sequential and Concurrent Abstract Machines for Interaction Nets. In J. Tiuryn, editor, *Proceedings of Foundations of Software Science and Computation Structures (FOSSACS'00)*, number 1784 in Lecture Notes in Computer Science, pages 267–282. Springer-Verlag, 2000.

Recursion patterns and time-analysis. *ACM SIGPLAN Notices*, 40(5):45–54, 2005.

Thesis

– J. S. Pinto. *Parallel Implementation with Linear Logic (Applications of Interaction Nets and of the Geometry of Interaction)*. PhD thesis, École Polytechnique, 2001.