Research Report 1993

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RESEARCH REPORT - 1993

Preface

Instituto Superior Técnico (IST) was founded in 1911 with the aim of becoming the leading school of engineering in Portugal. In 1930, together with three other higher education institutes, IST was incorporated into the Universidade Técnica de Lisboa, and presently it is one of the seven schools of this university. Up until 1980 the institute did not have a formal mathematics department, the mathematics courses for engineering students being mostly taught by engineering graduates.

When the Department of Mathematics was created in 1980 it was just a service department for the teaching of mathematics in the engineering programs at IST and counted only five members holding PhD level degrees. In 1983 the department initiated a formal graduate program and adopted the goal of becoming a research department as well. This was the beginning of a period of fast development that is still in progress. Three years later, in 1986, the department began offering its own undergraduate degree in Applied Mathematics and Computer Science, emphasizing mathematical analysis, numerical analysis, statistics and computer science.

At present, the department has 40 members holding PhD degrees and relies on the contribution of a large number of teaching assistants. Most of these are also graduate students in mathematics.

For administrative purposes, the department is divided into four sections: *Algebra and Mathematical Analysis, Statistics and Applications, Applied Mathematics and Numerical Analysis, and Computer Science*. The first section accounts for slightly more than half of the department and includes that part of applied mathematics related to differential and integral equations, linear operator theory and dynamical systems. In spite of the name of this first section, motivated by historical reasons related to the courses taught at the institute, most of the research activity in this section is on mathematical analysis, and it is within this section that areas like geometry and topology are developing. We are also looking forward to the time when research in algebra can be strengthened in the department.

We regard the annual publication of a research report as an important vehicle, with two complementary purposes. One is internal: to highlight *research publications* by department members and their involvement in *international scientific exchange* as a public statement of the importance we attach to them; the other is external: to provide information to interested people outside the department about our current research work.

I would like to thank everyone who was involved in the organization of this third issue, especially Professor Roger Picken, who coordinated the preparation of the report. I am also grateful to Rita Torres for her work in word processing this issue.

Lisbon, April 1994

The Department Chairman

Luis T. Magalhães.

Research areas

The main areas of research pursued in the Department of Mathematics of IST are:

Theory of Distributions and Ultradistributions

The work in this area has addressed problems such as algebraic and topological aspects of some concepts of limit and value of a distribution at a point, generalization to distributions on manifolds of certain results of classical analysis like, for instance, Stoke's theorem, multiplicative product of ultradistributions and limit of an ultradistribution at a point.

Operator Theory and Integral Equations

The work focussed on various classes of singular operators, namely Toeplitz-like, Hankel, Cauchy-type, Carleman shift, Bessel potential and pseudodifferential operators. In this context factorization theory was extended by complex-analytic and algebraic means. Applications were treated in concrete and abstract formulations: Integral equations on unions of intervals and several elliptic boundary-transmission problems for Lipschitz domains in Sobolev and in Hölder-Zygmund spaces. In particular, some well-known problems of diffraction by wedges, both conducting and dielectric, were solved.

Dynamical Systems and Differential Equations

The dominant research in this area falls within the general field of mathematical analysis with an emphasis on non-linear problems whose interest in applications is well known. The activities cover the following subjects: dynamical systems, differential and functional equations, calculus of variations and optimization, geometric methods in non-linear analysis, control theory, geometrical mechanics and mechanics of continuous media. The research is organized along three lines of work: qualitative theory of dynamical systems, methods of non-linear analysis in mechanics of continuous media and methods of non-linear systems analysis in control theory.

Geometry and Topology

The work in this area is mostly concerned with problems spanning geometry and analysis, namely questions related to the theory of Atiyah-Singer and von Neumann algebras, K-theory and noncommutative geometry, symplectic geometry and mathematical physics.

Probability, Statistics and Applications

The research in this general area has focused on queueing theory and quality control, multivariate analysis, stochastic optimization, categorical data analysis and statistical inference. In queueing theory and quality control, interest is concentrated on order relations, transient behaviour, threshold problems, and on control charts. In the area of multivariate analysis, topics of interest are factor analysis and related models, multidimensional scaling and discriminant analysis. Particular attention is given to the study of the robustness of these methods. In categorical data analysis and statistical inference, emphasis has been given to incomplete data and statistical theory advanced topics relying on measure and integration.

Numerical Analysis

Two lines of research are pursued: mathematical and numerical analysis in fluid dynamics, and numerical methods for differential and integral equations. The first focuses mainly on the non-linear behaviour of real, incompressible flow phenomena, including visco-elastic liquids with short memory and viscous fluids with polymer additives. The models under consideration, in particular the so-called models of grade type, are strongly supported by viscometric experiments. The numerical study of the Stokes and Navier-Stokes equations by the boundary and finite element methods, as well as by domain decomposition methods, is also addressed. The research on numerical methods for differential and integral equations is mainly directed towards: i) convergence acceleration techniques for ordinary differential equations, including extrapolation algorithms for differential equations with singularities when the usual methods converge very slowly; ii) integral equation methods applied to problems in material science (elasticity and effective properties of composite materials); iii) spline collocation methods for Volterra integral equations with singular kernels and new Gronwall-type inequalities for studying their convergence.

Computer Science

The work in this area addresses formal system specification with emphasis on the mathematical foundations of object-orientation and concurrency, as well as on verification logics. Most of the work has been carried out within the scope of international cooperation projects, namely the ESPRIT Basic Research Actions IS- CORE and COMPASS.

There are also some individual members of the department working in other areas, such as logic, mathematical physics and operations research.

1 Publications

1.1 Publications which appeared in 1993

Algebra and Mathematical Analysis

Almeida, P., La géometrie non-commutative par l'example, Actes du IVème Séminaire de Recherche en Analyse, Géometrie et Applications, Lokassa, Benin, 1993.

Bastos, M. A. and dos Santos, A. F., Convolution operators on a finite interval with periodic Kernel-Fredholm property and invertibility, *Integr. Equat. Oper. Th.* **16** (1993) 186 - 223.

Bastos, M. A. and dos Santos, A. F., Generalized factorization for a class of 2x2 matrix functions with rationally - independent entries., *Complex Variables Theory Appl.*, **22** (1993) 156-174.

M. C. Bento, O. Bertolami, J. M. Mourão and R. F. Picken Eds., *Classical and Quantum Gravity*, Proceedings of the First Iberian Meeting on Gravity, World Scientific 1993.

Câmara, M. C., Lebre, A. B. and Speck, F.-O., Generalised factorisation for a class of Jones form matrix functions., *Proc. Roy. Soc. Edinburgh* **123A** (1993) 401 - 422.

Castilla, M. S. A., Moauro, V., Negrini, P. and Oliva, W. M., The four positive vortices problem: Regions of chaotic behavior and the non-integrability, *Ann. Inst. H. Poincaré* **59** *Phys. Théor.* (1993) 99 - 115.

Campos Ferreira, J., *Introdução à Teoria das Distribuições,* Fundação Calouste Gulbenkian, 1993.

Cordovil, R. and Fukuda, K., Oriented matroids and combinatorial manifolds, *European J. Combin.* **14** (1993) 9 - 15.

Cordovil, R. and Moreira, M. L., Bases-cobases graphs and polytopes of a matroid, *Combinatorica* **13** (1993) 157 - 165.

Cordovil, R. and Moreira, M. L., A homotopy theorem on oriented matroids, *Discrete Math.* **111** (1993) 131 - 136.

Duduchava, R. and Speck, F.-O., Pseudodifferential operators on compact manifolds with Lipschitz boundary, *Math. Nachr.* **160** (1993) 149 - 191.

Faria, T. and Magalhães, L. T., Normal forms for functional differential equations and applications, in the Proceedings of Equadiff 91, International Conference on Differential Equations, C. Perelló, C. Simó and J. Solá - Morales Eds., World Scientific 1993, pp. 474 - 478.

Fernandes, R. L., On the master symmetries and bi-hamiltonian structure of the Toda lattice, *J. Phys. A* **26** (1993) 3797-3803.

Ferreira, J. M., Oscillations in difference equations, in the Proceedings of Equadiff 91, International Conference on Differential Equations, C. Perelló, C. Simó and J. Solá-Morales Eds., World Scientific 1993, pp. 484 - 490.

Freitas, P. and Rocha, C., Bogdanov singularity in the Fitzhugh-Naguno equations, in the Proceedings of Equadiff 91, International Conference on Differential Equations, C. Perelló, C. Simó and J. Solá-Morales Eds., World Scientific, 1993, pp. 496 - 500.

Henriques, P. G., The Noether theorem and the reduction procedure for the variational calculus in the context of differential systems, *C. R. Acad. Sci. Paris, Ser. I Math.*, **317** (1993) 987 - 992.

Henriques, P. G., Calculus of variations in the context of exterior differential systems, *Diff. Geom. Appl.* **3** (1993) 331 - 372.

Henriques, P. G., Well-posed variational problem with mixed endpoint conditions, *Diff. Geom. Appl.* **3** (1993) 373 - 393.

Karlovich, Yu. I. and Litvinchuk, G. S., On generalization of the factorization of measurable matrix-functions and its applications to Fredholm theory for certain classes of convolution-type equations, *Demonstratio Math.* **26** (1993) 597 - 604.

Kupka, I. and Oliva, W. M., Dissipative mechanical systems, *Resenhas IME - USP* **1** (1993) 69 - 115.

Lampreia, J. P. and Sousa Ramos, J., Trimodal Maps, *Int. J. Bifurcation and Chaos* **3** (1993) 1607 - 1617.

Magalhães, L. T., Finite and infinite dimensional dynamics defined by retarded functional differential equations, in the Proceedings of Equadiff 91, International Conference on Differential Equations, C. Perelló, C. Simó and J. Solá - Morales Eds., World Scientific 1993, pp. 711 - 715.

Matos, J. P., Regularity results in the two-well problem, in the Proceedings of Equadiff 91, International Conference on Differential Equations, C. Perelló, C. Simó and J. Solá - Morales Eds., World Scientific 1993, pp. 736 - 739.

Meister, E., Penzel, F., Speck, F.-O. and Teixeira, F. S., Some interior and exterior boundary value problems for the Helmholtz equation in a quadrant, *Proc. Roy. Soc. Edinburgh* **123A** (1993) 275 - 294.

Meister, E., Penzel, F., Speck, F.-O. and Teixeira, F. S., Two media scattering problems in a half-space, *Z. Angew. Math. Mech.*, **73** (1993) T793-T795.

Oliva, W. M., Monotone systems and transversality, in the Proceedings of Equadiff 91, International Conference on Differential Equations, C. Perelló, C. Simó and J. Solá - Morales Eds., World Scientific 1993, pp. 208 - 214.

Oliva, W. M., Kuhl, N. M. and Magalhães, L. T., Diffeomorphisms of $\mathbf{R}^n$ with oscillatory jacobians, *Publ. Mat.* **37** (1993) 255-269.

Penzel, F. and Speck, F.-O. Asymptotic expansion of singular operators on Sobolev spaces, *Asymptotic Anal.* **7** (1993) 287 - 300.

Picken, R. F., Loop spaces and a geometrical approach to path integral quantization, in Quantization and coherent state methods, Proceedings of the XI Workshop on Geometric Methods in Physics, S. Twareque Ali, I. M. Mladenov and A. Odzijewicz Eds., World Scientific 1993, pp. 75 - 89.

Picken, R. F., Loop spaces and path integral quantization, in Classical and Quantum Gravity, Proceedings of the First Iberian Meeting on Gravity, M. C. Bento, O. Bertolami, J. M. Mourão and R. F. Picken eds., World Scientific 1993, pp. 316 - 321.

Ribeiro, L., Sur une notion de limite d'une ultradistribution en un point - I, *Portugaliae Matematica* **50** (1993) 11 - 27.

Ribeiro, L., Sur une notion de limite d'une ultradistribution en un point - II, *Portugaliae Matematica* **50** (1993) 343 - 351.

Rocha, C., Some remarks on the singular problem for the scalar parabolic equation with variable diffusion, in the Proceedings of Equadiff 91, International Conference on Differential Equations, C. Perelló, C. Simó and J. Solá - Morales Eds., World Scientific 1993, pp. 832 - 837.

Statistics and Applications

Branco, J. A. and Silva, R., Um modelo de classes latentes para análise comparativa de práticas pedagógicas, in Estatística Robusta, Extremos e Mais Alguns Temas, D. Pestana Ed., Novas Perspectivas/Estatística, Salamandra, Lisboa, 1993, pp. 9 - 19.

Branco, J. A., Evocação de J. Tiago de Oliveira, in Estatística Robusta, Extremos e Mais Alguns Temas, D. Pestana Ed., Novas Perspectivas/Estatística, Salamandra, Lisboa, 1993, pp. 235 - 240.

Paulino, C. D. M., A teoria clássica da suficiência numa caracterização bayesiana de identificabilidade, in Estatística Robusta, Extremos e Mais Alguns Temas, D. Pestana Ed., Novas Perspectivas/Estatística, Salamandra, Lisboa, 1993, pp. 61 - 71.

Paulino, C. D. M., O modelo estatístico bayesiano e sua estrutura matemática; Independência condicional e suficiência bayesiana amostral; Identificabilidade paramétrica, in Teoria Estatística, Carlos Pereira Ed., IMPA, Rio de Janeiro, 1993, pp.118 - 176.

Pires, A. M. and Branco, J. A., Uma função discriminante linear robusta com base na função de influência, in Estatística Robusta, Extremos e Mais Alguns Temas, D. Pestana Ed., Novas Perspectivas/Estatística, Salamandra, Lisboa, 1993, pp. 81-93.

Ramalhoto, M. F., Some generalizations of the two classical Erlang formulas, Bulletin of the International Statistical Institute, 49th Session, Firenze 1993, pp. 329 - 330.

Ramalhoto, M. F., Second European Forum for Continuing Engineering Education scans the European Community scene, *Internat. J. Continuing Engineering Education* **3** (1993) 17 - 25.

Ramalhoto, M. F. and Bonfim, An atlas for opportunities in advanced training, in the Proceedings of the 2nd European Forum for Continuing Engineering Education, Lisbon, 1993, pp. 164 - 170.

Ramalhoto, M. F., Improving educational productivity: some new challenges, in the Proceedings of the 2nd European Forum for Continuing Engineering Education, Lisbon, 1993, pp.
237 - 245.

Silva, G. L., Regressão logística generalizada via SOC, in Estatística Robusta, Extremos e Mais Alguns Temas, D. Pestana Ed., Novas Perspectivas/Estatística, Salamandra, Lisboa, 1993, pp. 95-103.

Applied Mathematics and Numerical Analysis

Porta Nova, A. M. de O. and Wilson, J. R., Selecting control variates to estimate multiresponse simulation metamodels, *European J. Oper. Res.* **71** (1993) 80 - 94.

Rosa, A. A. and Porta Nova, A. M., Abordagem ao problema da localização de um centro de tratamento de correio e sua rede de transporte, *Investigação Operacional* **13** (1993) 31 - 49.

Computer Science

Böhm, K. and Sernadas, A., Real-time object specification logic, in The Deductive Approach to Information Systems and Databases 93, A. Olivé Ed., Universitat Politècnica de Catalunya 1993, pp. 159 - 174.

Brass, S., Lipeck, U. and Resende, P., Specification of object behaviour with defaults, in the Proceedings of IS-CORE'93, U. Lipeck and G. Koschorreck Eds., Universität Hannover 1993, pp. 155 - 177.

Costa, J. F. and Sernadas, A., Categorical Framework for process interconnection, *INESC Journal of Research and Development*, **44** (1993) 81 - 93.

Dionísio, M., Brass, S. and Ryan, M., Reasoning about extensions, in the Proceedings of IS-CORE'93, U. Lipeck and G. Koschorreck Eds., Universität Hannover 1993, pp. 178 - 196.

Ehrich, H.-D., Denker, G. and Sernadas, A., Constructing systems as object communities, in TAPSOFT'93:Theory and Practice of Software Development, M.-C. Gaudel and J.-P. Jouannaud Eds., Springer Verlag 1993, pp. 453 - 467.

Gouveia, P., Sernadas, C., Gomes, J. and Apolinário, M. J., Tableaux for reasoning about objects, in Theorem Proving With Analytic Tableaux and Related Methods, D. Basin, R. Hahnle, B. Fronhofer, J. Posegga and C. Schwind Eds., Max - Planck Institut für Informatik 1993, pp. 113 - 123.

Gouveia, P. and Sernadas, C., Reasoning aspects in information systems and databases, in The Deductive Approach to Information Systems and Databases 93, A. Olivé Ed., Universitat Politècnica de Catalunya 1993, pp. 201 - 224.

Ryan, M., Towards specifying norms, *Annals of Mathematics and Artificial Intelligence* **9** (1993) 49 - 67.

Santos, F. and Carmo, J., A deontic logic representation of contractual obligations, in Deontic Logic in Computer Science: Normative System Specification, J. - J. Ch. Meyer and R. J. Wieringa Eds., John Wiley & Sons 1993, pp. 243 - 257.

Sernadas, A. and Sernadas, C., Denotational semantics of object specification within an arbitrary temporal logic institution., in the Proceedings of IS-CORE'93, U. Lipeck and G. Koschorreck Eds., Universität Hannover 1993, pp. 61 - 89.

Zanardo, A. and Carmo, J., Ockhamist computational logic: past necessitation in CTL*, *Journal of Logic Comput.*, **3** (1993) 249 - 268.

1.2 Publications which have been submitted in 1993

Algebra and Mathematical Analysis

Aizenshtat, A. V., Karlovich, Yu. I. and Litvinchuk, G. S., The method of conformal gluing for the Haseman Boundary Value Problem on an open contour, Preprint 26/93.

Buescu, J. and Stewart, I., Liapunov stability and adding machines, to appear in *Ergodic Theory Dynamical Systems.*

Buescu, J. and Stewart, I., Sets, lines and adding machines, to appear in the Proceedings of Dynamics, Bifurcation and Symmetry, P. Chossat Ed.

Buescu, J., Transitive sets with non-empty interior, Preprint.

Caetano, A. and Picken, R. F., An axiomatic definition of holonomy, Preprint 22/93, to appear in *Internat. J. Math.*

Câmara, M. C. and dos Santos, A. F., Generalized factorization for a class of n∞n matrix functions - partial indices and explicit formulas, to appear in *Integr. Equat. Oper. Th.*

Câmara, M. C. and dos Santos, A. F., Bastos, M. A., Generalized factorization for Daniele-Khrapkov matrix functions - partial indices, Preprint 15/93.

Câmara, M. C. and dos Santos, A. F., Bastos, M. A., Generalized factorization for Daniele Khrapkov matrix functions - explicit formulas, Preprint 16/93.

Cordovil, R. and Fachada, J. L., Braid monodromy groups of wiring diagrams, Preprint 14/93.

Costa, F. P., On the positivity of solutions to the Smoluchowsky equations, Preprint.

Costa, F. P., Existence and uniqueness of density conserving solutions to the coagulation-fragmentation equations with strong fragmentation, Preprint.

Costa, F. P. and Carr, J., Asymptotic behaviour of solutions to the coagulation-fragmentation equations, II: Weak fragmentation, to appear in *J. Statist. Phys.*

Dias, E. S. and Roberts, R. M., A geometric Hamiltonian approach to the affine rigid body, to appear in the Proceedings of Dynamical Systems, Bifurcation and Symmetry, Cargèse, September 1993.

Dias, E. S. and Roberts, R. M., Local reduction of symmetric Hamiltonian systems, Preprint.

Freitas, P., Stability of stationary solutions of a nonlocal reaction-diffusion equation, Preprint.

Freitas, P., Bifurcation and stability of stationary solutions of non-local scalar reaction-diffusion equations, to appear in *J. Differential Equations.*

Freitas, P. and Grinfeld, M., Multiplicity and stability of stationary solutions of an equation modelling Ohmic Heating, Preprint.

Fusco, G. and Oliva, W. M., Integrability of a system of N electrons subjected to Coulombian interactions, to appear in *Comm. Math. Phys.*

Gurtin, M. E. and Matias, J. C., On the dynamics of crystalline motion, Preprint.

Girão, P. M., Convergence of a crystalline algorithm for the motion of a simple closed convex curve by weighted curvature, to appear in *SIAM J. Numer.Anal.*

Girão, P. M. and Kohn, R. V., Convergence of a crystalline algorithm for the heat equation in one dimension and for the motion of a graph by weighted curvature, to appear in *Numer. Math.*

Giga, Y., Gurtin, M. E. and Matias, J. C., Thermomechanics and the formulation of the Stefan problem for fully faceted interfaces, to appear in *Quart. Appl. Math.*

Kravchenko, V. G., Lebre, A. B., Litvinchuk, G. S. and Teixeira, F. S., Noether theory for a class of singular integral operators with Carleman shift and unbounded coefficients, to appear in *Math. Nachr.*

Kravchenko, V. G., Lebre, A. B., Litvinchuk, G. S. and Teixeira, F. S., A normalization problem for a class of singular integral operators with Carleman shift and unbounded coefficients, Preprint 11/93.

Kravchenko, V. G. and Litvinchuk, G. S., On the C*-algebra of singular integral operators with Carleman shift on a non-closed arc, Preprint 2/93, to appear in *Integr. Equat. Oper. Th.*

Kravchenko, V. G. and Litvinchuk, G. S., *Introduction to the theory of singular integral operators with shift*, monograph, 288p., to be published by Kluwer.

Loura, L. and Viegas, F. S., Tempered ultradistributions, Preprint.

Meister, E., Penzel, F., Speck, F.-O. and Teixeira, F. S., Two canonical wedge problems for the Helmholtz equation, to appear in *Math. Meth. Appl. Sci.*

Okamoto, S., Decomposition of subfactors by tensor product of intermediate subfactors, Preprint.

Oliva, W. M., Oliveira, J. C. F. and Solà-Morales, J., An infinite dimensional Morse-Smale map, to appear in *Journal of Nonlinear Differential Equations and Applications.*

Picken, R. F., Non-local variables in quantum gravity and Vassiliev invariants, to appear in the Proceedings of the II Workshop an Constraints Theory and Quantization Methods, Montepulciano, Italy, June 28th-July 1st, 1993.

Picken, R. F., Loop variables in quantum gravity and generalized knot invariants, to appear in the Proceedings of the XII Workshop on Geometrical Methods in Physics, Bialowieza, Poland, July 1st-7th, 1993.

Ragazzo, C., Koiller, J. and Oliva, W. M., Motion of massive vortices, to appear in *J. Nonlinear Sci.*

Statistics and Applications

Branco, J. and Pires, A. M., Projection Pursuit: uma estratégia geral para análise de observações multivariadas, to appear in the Proceedings of I Congresso Anual da Sociedade Portuguesa de Estatística.

Branco, J., Pires, A. M., Mendonça, E. and Picado, A. M., A statistical evaluation of toxicity tests of waste waters, to appear in Proceedings of the SPRUCE II Conference.

Ferreira, M. and Ramalhoto, M. F., Study of some of the basic parameters of the busy period distribution of the M/G/OO System, to appear in the Proceedings of the 1st Annual Congress of the Portuguese Statistical Society.

Pacheco, A., Second order properties of the loss probability in M/M/s/s+c systems, to appear in *Queueing Systems.*

Pacheco, A., Some properties of the delay probability in M/M/s/s+c systems, to appear in *Queueing Systems.*

Paulino, C. D. M. and Pereira, C. A. B., Bayesian methods for categorical data under informative general censoring, to appear in *Biometrika.*

Paulino, C. D. M. and Pereira, C. A. B., On identifiability of parametric statistical models, Preprint.

Pires, A. M. and Branco, J. A., Estatística robusta: passado, presente e futuro, to appear in the Proceedings of I Congresso Anual da Sociedade Portuguesa de Estatística.

Prabhu, N. U. and Pacheco, A., A storage model for data communication systems, to appear in *Theory Prob. Appl.*

Ramalhoto, M. F. and Morais, M., VSI policy applied to Control Charts X, CUSUM and EWMA, to appear in the Proceedings of the 1st Annual Congress of the Portuguese Statistical Society.

Ramalhoto, M. F., Generalizations of Erlang formulae and some of their 2nd order properties, to appear in Operations Research, 1993, published by Physica Verlag.

Applied Mathematics and Numerical Analysis

Abboud, T., Girault, V. and Sequeira, A., A stream function-vorticity formulation coupled with boundary integrals for the two - dimensional exterior Stokes problem, to appear in Acta Applicandae Mathematicae, Proceedings of the International Conference on Mathematical Problems for Navier-Stokes Equations, Cento, Italy, March 1st - 5th, 1993.

Lima, P. M. and Graça, M., Convergence acceleration for boundary value problems with singularities using the E - algorithm, to appear in *J. Comput. Appl. Math.*

Graça, M., Sequence transformations with Mathematica, Preprint.

Greengard, L. and Moura, M., On the numerical evaluation of electrostatic fields in composite materials, to appear in *Acta Numerica.*

Romeiras, F. J., The three-wave interaction of four waves revisited: A Lax pair and possibly general solution, to appear in Integrability and Chaotic Behaviour, J. Seimenis Ed., Plenum Press, London .

Computer Science

Brass, S., Lipeck, U. and Resende, P., Instantiation semantics of temporal defaults, University of Hannover Preprint.

Carmo, J. and Jones, A. J. I., Deontic database constraints and the characterisations of recovery, Preprint 17/93, to appear in the Proceedings of the Second International Workshop on Deontic Logic in Computer Science (Deon 94).

Costa, J. F. and Sernadas, A., Progress assumption in concurrent systems, to appear in *Formal Aspects of Computing.*

Costa, J. F., Sernadas, A. and Sernadas, C., Data encapsulation and modularity: three views of inheritance, to appear in Mathematical Foundations of Computer Science 1993, Springer Verlag.

Costa, J. F., Sernadas, A. and Sernadas, C., Object inheritance beyond subtyping, to appear in *Acta Inform.*

Gouveia, P. and Sernadas, C., Abduction in temporal object specification, Preprint INESC/DMIST.

Li, R. and Carmo, J., On completeness of a logic for temporal reasoning, Preprint 10/93.

Li, R. and Carmo, J., Fiadeiro. J., Historical databases: a positional perspective, Preprint 18/93.

Li, R., Fiadeiro. J. and Carmo, J., Incorporating a time dimension into OBLOG, Preprint 19/93.

Ryan, M., Belief revision and ordered theory presentations, to appear in Logic, Language and Information, A. Fuhrmann and H. Rott Eds., De Gruyter Publishers.

Ryan, M., Defaults in specifications, to appear in the Proceedings of the IEEE International Symposium on Requirements Engineering, IEEE Computer Society Press.

Ryan, M. and Schobbens, P.-Y., The lexicographic combination of preferences, Imperial College Preprint.

Ryan, M., Shanahan, M. and Dionísio, M., Preference relations from distance functions, Preprint INESC/DMIST.

Sernadas, A. and Sernadas, C., Denotational semantics of object specification within an arbitrary temporal logic institution, Preprint INESC/DMIST.

2 Academic degrees (awarded in 1993)

Doutoramentos/PhDs

Câmara, M. C., Doutoramento em Matemática, Instituto Superior Técnico, Universidade Técnica de Lisboa, 13.12.93. Thesis: *Factorização generalizada de símbolos matriciais - índices parciais e determinação de factores*, Supervisor: A. F. dos Santos.

Costa, F. P., PhD in Mathematics, University of Heriot-Watt, Edinburgh, Scotland, 14.7.93. Thesis: *Studies in discrete coagulation-fragmentation equations*, Supervisor: J. Carr. Equivalência ao Grau de Doutor em Matemática, Universidade Técnica de Lisboa, 26.11.93.

Girão, P., PhD in Mathematics, Courant Institute of Mathematical Sciences - New York University, USA, May 1993. Thesis: *Convergence of a crystalline algorithm for motion by weighted curvature,* Supervisor: Robert V. Kohn. Equivalência ao Grau de Doutor em Matemática, Universidade Técnica de Lisboa, 29.6.93.

Li, R., Doutoramento em Matemática, Instituto Superior Técnico, Universidade Técnica de Lisboa, 16.7.93. Thesis: *Maintaining temporal information: an axiomatic approach*, Supervisor: J. Carmo.

Matias, J. C., PhD in Mathematics, Carnegie-Mellon University, Pittsburgh, USA, April 1993. Thesis: *On the Stefan problem with crystalline interfacial energy*, Supervisor: M. E. Gurtin. Equivalência ao Grau de Doutor em Matemática, Universidade Técnica de Lisboa, 10.12.93.

Moura, M. R., PhD, Courant Institute of Mathematical Sciences - New York University, USA, May 1993. Thesis: *On the numerical calculation of electrostatic fields in composite media,* Supervisor: L. Greengard.

Oliva, W. M., Equivalência ao Grau de Doutor em Matemática, Universidade Técnica de Lisboa, 5.7.93.

Mestrados/MScs

Dominguez, L. A., Mestrado em Engª Electrotécnica e de Computadores, Instituto Superior Técnico. Thesis: *Prototipagem da lógica Unity no ambiente metalógico equacional ZOBJ*, Supervisor: G. Reichwein, 1.10.93.

Gouveia, P., Mestrado em Matemática Aplicada, Instituto Superior Técnico. Thesis: *Tableaux para raciocínio local sobre objectos*. Supervisor: C. Sernadas, 25.2.93.

Silva, G. L., Equiparação a Mestrado, Instituto Superior Técnico, Universidade Técnica de Lisboa, 5.6.93

Teixeira, J. P., Mestrado em Matemática Aplicada, Instituto Superior Técnico, Sept. 1993. Thesis: *Uma classe de semi-grupos de operadores não lineares*. Supervisor: J. M. Ferreira.

3. Lectures and participation in conferences

3.1 Lectures in international conferences

Algebra and Mathematical Analysis

Buescu, J., Liapunov stability and adding machines, Dynamics, Bifurcation and Symmetry, Cargèse, France, 3.9.93 - 9.9.93.

Buescu, J., Loss of transverse stability in symmetric chaos, Warwick-Tubingen Nonlinear Collaboration Workshop, Warwick, United Kingdom, 1.12.93.

Costa, F. P., A finite-dimensional model for gelation and coarsening problems, Spatio-Temporal Evolution of Patterns in Nonlinear Mechanics, de Bilt, Utrecht, Netherlands, May 93.

Dias, M. E, A geometric Hamiltonian approach to the affine rigid body, Dynamical Systems, Bifurcations and Symmetry, Cargèse, France, 3.9.93 - 9.9.93.

Freitas, P, Stability of stationary solutions of nonlocal reaction-diffusion equations, Equadiff 93, Bratislava, Slovak Republic, Aug. 93.

Freitas, P., Stability of stationary solutions for a model for phase-separation of binary mixtures, Spatio-Temporal Evolution of Patterns in Nonlinear Mechanics, de Bilt, Utrecht, Netherlands, May 93.

Girão, P., Convergence of a crystalline algorithm for the motion of a simple closed convex curve by weighted curvature, 1993 SIAM Annual Meeting, Philadelphia, USA, July 1993.

Lebre, A. B., Some matrix-factorization problems, 10th Conference on Problems and Methods in Mathematical Physics, Technische Universität Chemnitz-Zwickau, Germany, 13.9.93 - 17.9.93.

Martins, P., Ramos, J. S., Homological invariants of two-dimensional dynamical systems (Poster), Dynamics Days, Poznan, Poland, 9.6.93 - 12.6.93.

Oliva, W. M., Formation of symmetric structures on a system of repelling particles, International Workshop on Dynamical Systems, IMPA, Rio de Janeiro, Brazil, Aug. 93.

Picken, R. F., Non-local observables in quantum gravity and Vassiliev invariants, Ist Algarve Workshop on Gravity and Quantum Field Theory, Faro, Portugal, 16.2.93.

Picken, R. F., Vassiliev invariants; a course of 3 lectures given at the II Meeting on Knot Theory and Physics, Porto, Portugal, 14.6.93 - 17.6.93.

Picken, R. F., Non-local variables in quantum gravity and Vassiliev invariants, II Workshop on Constraints Theory and Quantization Methods, Montepulciano, Italy, 28.6.93 - 1.7.93.

Picken, R. F., Loop variables in quantum gravity and generalised knot invariants, XII Workshop on Geometrical Methods in Physics, Bialowieza, Poland, 1.7.93 - 7.7.93.

Sarreira, M., Ramos, J. S., Trees and subtrees in the Mandelbrot set (Poster), Dynamics Days, Poznan, Poland, 9.6.93 - 12.6.93.

Severino, R., Ramos, J. S., Proprieties of the topological invariants in bimodal maps (Poster), Dynamics Days, Poznan, Poland, 9.6.93 - 12.6.93.

Statistics and Applications

Branco, J. A., A statistical evaluation of toxicity tests of waste waters, SPRUCE II, Rothamsted, England, 13.9.93 - 16.9.93.

Branco, J. A., Projection Pursuit: uma estratégia geral para análise de observações multivariadas, I Congresso Anual da Sociedade Portuguesa de Estatística, Vimeiro, Portugal, 14 .6.93 - 17.6.93.

Freitas, A., Paulino, C. D. M., Análise de sobrevivência dos casos de SIDA em Portugal, I Congresso Anual da Sociedade Portuguesa de Estatística, Vimeiro, Portugal, 14.6.93 - 17.6.93.

Morais, M. J., Política VSi Aplicada às cartas de controlo $\overline{X}$, CUSUM e EWMA, I Congresso Anual da Sociedade Portuguesa de Estatística, Vimeiro, Portugal, 14 .6.93 - 17.6.93.

Pires, A. M., Estatística robusta: passado, presente e futuro, I Congresso Anual da Sociedade Portuguesa de Estatística, Vimeiro, Portugal, 14 .6.93 - 17.6.93.

Paulino, C. D. M., Bayesian analysis of incomplete categorical data with nonignorable reporting process, 5th Latin American Congress in Probability and Mathematical Statistics, São Paulo, Brazil, July 93.

Ramalhoto, M. F., Queuing systems with certain types of thresholds, 21st Conference on Stochastic Processes and their Applications, Toronto, Canada, 14.6.93 - 19.6.93.

Ramalhoto, M. F., A Third Erlang Formula, 22nd Conference on stochastic processes and their applications, Vrije Universiteit Amsterdam, Netherlands, 21.6.93 - 25.6.93.

Ramalhoto. M. F., Some new duties of the modern university, Third International Symposium on the Role of Universities in Developing Areas, Azores, Portugal, 7.7.93 - 9.7.93.

Ramalhoto, M. F., Stochastic modelling and quality control in the retraining of engineers, in the Panel on Probability Modelling in Continuing Engineering Education (Invited Session), XIII World Conference on Operations Research, IFORS 93, Lisbon, 12.7.93 - 16.7.93.

Applied Mathematics and Numerical Analysis

Lima, P., Convergence acceleration for boundary value problems with singularities using the E - algorithm, International Colloquium on Numerical Analysis, Plovdiv, Bulgaria, 13.8.93-17.8.93.

Moura, M., On the evaluation of electrostatic fields in composite media, SIAM Conference on Emerging Issues in Mathematics and Computation from the Materials Sciences, Pittsburg, USA 18.4.93 - 20.4.93.

Romeiras, F., The three-wave interaction of four waves revisited: A Lax pair and general solution, International Conference on Hamiltonian Mechanics, Integrability and Chaotic Behaviour, Torun, Poland, 28.6.93 - 2.7.93.

Sequeira, A., Classical Solutions for the equations of second grade fluids, Winter School, Mathematical Theory in Fluid Mechanics, Paserky, Czech Republic 12.12.93 - 18.12.93.

Sequeira, A., Coupling the stream function-vorticity formulation with boundary integrals for the exterior Stokes problem, International Conference on Mathematical Problems for Navier-Stokes Equations, Cento, Italy, 1.3.93 - 5.3.93.

Videman, J., Existence and uniqueness of classical solutions of the equations of motion of the third grade fluids, 3rd Winter School on Mathematical Theory in Fluid Mechanics, Paserky, Czech Republic, 12.12.93 - 18.12.93.

Computer Science

Caleiro, C., Operational semantics of temporal specifications, 5th COMPASS Workshop, Dresden, Germany, 20.9.93 - 24.9.93.

Caleiro, C., Operational semantics of temporal specifications, FAC3 Workshop'93, Lisboa, 10.9.93.

Dionísio, F., Reasoning about extensions, IS-CORE Workshop'93, Hannover, Germany, 27.9.93 - 28.9.93.

Dionísio, F., Reasoning about extensions, FAC3 Workshop'93, Lisboa, 10.9.93.

Dominguez, L., Theorem proving for UNITY, FAC3 Workshop'93, Lisboa, 10.9.93.

Gouveia, P., Raciocínio abdutivo na verificação de objectos, FAC3 Workshop'93, Lisboa, 10.9.93.

Gouveia, P., Reasoning aspects in information systems and databases, Workshop on the Deductive Approach to Information Systems and Databases 93, Lloret de Mar, Spain, 20.9.93 - 22.9.93.

Gouveia, P., Tableaux for reasoning about objects, Workshop on Theorem Proving with Analytic Tableaux and Related Methods, Marseille, France, 28.4.93 - 30.4.93.

Ramos, J., Specification and verification of the ABP, FAC3 Workshop'93, Lisboa, 10.9.93.

Ramos, J., Verification of a temporal specification of the ABP, IS-CORE SG1 Working Meeting, Oxford, England, 29.3.93 - 31.3.93.

Resende, P., Non-monotic specification of objects, IS-CORE SG4 Working Meeting, Hannover, Germany, 24.5.93 - 27.5.93.

Resende, P., Non-monotonic specification of objects behaviour, FAC3 Workshop'93, Lisboa, 10.9.93.

Sernadas, A., A denotational semantics of object specification within an arbitrary temporal logic institution, European Summer School on Language, Logic and Information '93, Lisbon, 16.8.93 - 27.8.93.

Sernadas, A., A denotational semantics of object specification within an arbitrary temporal logic institution, IS-CORE Workshop'93, Hannover, Germany, September 27.9.93 - 28.9.93.

Sernadas, A., Denotational semantics of object specification, IS-CORE SG1 Working Meeting, Oxford, England, 29.3.93 - 31.3.93.

3.2   Invited lectures

Algebra and Mathematical Analysis

Buescu, J., Liapunov stability and adding machines, invited lecture for the Ergodic Theory and Dynamical Systems Seminar, University of Warwick, England, 1.6.93.

Costa, F. P., A finite-dimensional model for gelation in coagulation problems, PhD seminars, Dept. of Mathematics, Heriot-Watt University, Edinburgh, Scotland, Jan. 93.

Dias, M. E., Ellipsoidal figures of equilibrium for Dirichlet's problem, Institut Non-Lineaire de Nice, Université de Nice - Sophia Antipolis, Nice, France, 7.12.93.

Freitas, P., Some problems in nonlocal reaction-diffusion equations, Dept. of Mathematics, University of Bath, England, May 93.

Freitas, P., Some problems in nonlocal reaction-diffusion equations, Dept. of Mathematics, University of Bristol, England, May 93.

Oliva, W. M., Integrability of a system of repelling particles in R^n, Universitat Autonoma de Barcelona, Spain, April 93.

Oliva, W. M., Diffeomorphisms in R^n with oscillatory jacobians, Universitá degli Studi di Trento and Universitá degli Studi de Padova, Italy, June 93.

Paluch, M., Higher algebraic K-theory of compact topological spaces and the Bott element, séminaire de K-théorie, séance de Janvier, Université de Paris VII, 23.1.93.

Rocha, C., Singular perturbations for reaction-diffusion equations, CDSNS, Georgia Institute of Technology, Atlanta, USA, 1.4.93.

Rocha, C., Heteroclinic orbits in scalar semilinear parabolic equations, CDSNS, Georgia Institute of Technology, Atlanta, USA, 26.4.93.

Rocha, C., Heteroclinic connections in one-dimensional reaction-diffusion equations, Universitat Autónoma de Barcelona, Spain, 13.5.93.

Speck, F.-O., Operadores de Wiener-Hopf, Universidade de Aveiro, 5.3.93.

Statistics and Applications

Paulino, C.D.M., Incomplete categorical data - a bayesian solution with no classical parallel, Instituto de Matemática e Estatística, University of São Paulo, Brazil, June 93.

Paulino, C. D. M., Estrutura matemática do modelo estatístico bayesiano (course in statistics theory), 19º Colóquio Brasileiro de Matemática, IMPA, Rio de Janeiro, Brazil, July 93.

Applied Mathematics and Numerical Analysis

Moura, M., Cálculo numérico de campos eletrostáticos em materiais compostos, Instituto de Matemática Pura e Aplicada, Rio de Janeiro, Brazil, Jan. 93.

Sequeira, A., Éxistence de solutions classiques pour les équations des fluides non-newtoniens du second grade, Centre de Mathématiques Appliquées (École Polytechnique), Palaiseau, France, 22.11.93.

Sequeira, A., Formulation en fonction courant-tourbillon pour le problème extérieur de Stokes 2D, Dept. of Mathematics, University of Nantes, France, 27.1.93.

Sequeira, A., Formulation en potentiel vecteur du problème extérieur de Stokes 3D, Dept. of Mathematics, University of Reims, France, 27.1.93.

Computer Science

Carmo, J. and Alegre, M.J., Logics for database deontic specifications, 1st Meeting of the JURAD Project, London, 19.4.93 - 20.4.93.

Carmo, J. and Jones, A.J.I., Deontic integrity constraints, 2nd Meeting of the JURAD Project, Sesimbra, Portugal, 20.9.93 - 21.9.93.

3.3   Organization of Conferences held in 1993

Statistics and Applications

Branco, J., Member of the organizing comittee and chairman, I Congresso Anual da Sociedade Portuguesa de Estatística, Vimeiro, Portugal, 14.6.93 - 17.6.93.

Pires, A., Member of the organizing committee, I Congresso Anual da Sociedade Portuguesa de Estatística, Vimeiro, Portugal, 14.6.93 - 17.6.93.

Ramalhoto, F., Organizer and chairperson of the panel: Probability Modelling in Continuing Engineering Education, IFORS'93, Lisbon, 1993.

Computer Science

Sernadas, A., Sernadas, C., Members of the program committee, 9th International Conference on Data Engineering, Viena, Austria, 19.4.93 - 23.4.93.

Sernadas, A., Sernadas, C., Members of the program committee, CAiSE93: 5th Conference on Advanced Information Systems Engineering, Sorbonne, Paris, 8.6.93 - 11.6.93.

4. Guest program

4.1 Visits

Algebra and Mathematical Analysis

Giorgio Fusco, Universitá di Roma II, 18.1.93 - 21.1.93.

Victor Kravchenko, Odessa State Hydrometeorological Institute, Ukraine, 4.2.93 - 26.2.93.

Vladislav Kravchenko, Odessa State University, Ukraine, 4.2.93 - 26.2.93.

Hugo Beirão da Veiga, Universitá di Pisa, Italy, 17.5.93 - 21.5.93.

Susumu Okada, University of Tasmania, Australia, 24.5.93 - 26.5.93.

Helmut Malonek, Universidade de Aveiro, 30.5.93.

Yu. I. Karlovich, Odessa State University, Ukraine, 14.6.93 - 6.7.93.

Konstantin Mischaikow, Georgia Institute of Technology, 15.6.93 - 25.6.93.

José Sousa Pinto, Universidade de Aveiro, 9.7.93.

Àngel Calsina, Universitat Autónoma de Barcelona, 12.7.93 - 18.7.93.

Irene Fonseca, Carnegie-Mellon University, 13.7.93.

T. Ha.-Duong, Univ. Tech. de Compiègne/CMAP École Polytechnique, 20.7.93.

Luc Tartar, Carnegie-Mellon University, 27.7.93.

Abraham C. -L. Chian, Cambridge University, 12.11.93.

Naum Krupnik, Bar-Ilan University, Israel, 8.12.93 - 16.12.93.

Ana Barroso, Carnegie-Mellon University, 14.12.93.

Applied Mathematics and Numerical Analysis

Giovanni Paolo Galdi, President of the Faculty of Engineering and of the Institute of Engineering, University of Ferrara, Italy, 21.9.93 - 25.9.93.

Abraham C.-L. Chian, University of Cambridge, 11.11.93 - 18.11.93.

Computer Science

Udo Lipeck, University of Hannover, Germany, 17.3.93 - 19.3.93.

Ana Moreira, University of Stirling, United Kingdom, 10.7.93.

Ralf Jungclaus, University of Braunschweig, Germany, 21.7.93 - 23.7.93.

Gunter Saake, University of Braunschweig, Germany, 21.7.93 - 23.7.93.

Andrew Jones, NRCCL, Oslo, Norway, 20.9.93 - 21.9.93.

Ton Maibaum, Imperial College, London, 20.9.93 - 21.9.93.

Marek Sergot, Imperial College, London, 20.9.93 - 21.9.93.

4.2 Lectures by visitors

Algebra and Mathematical Analysis

Giorgio Fusco, Phase transitions and singular solutions for the Cahn-Hilliard equation, 21.1.93.

Victor Kravchenko, On the normalization of certain singular integral operators, 9.2.93.

Vladislav Kravchenko, On the relation between quaternionic hyper-holomorphic functions and Maxwell equations, 9.2.93.

Helmut Malonek, Function theory in higher dimensions using Clifford algebras, 30.4.93.

Hugo Beirão da Veiga, Soluções periódicas da equação das ondas não linear, 20.5.93.

Susumu Okada, Finite Hilbert transforms and Symm's integral operator, 25.5.93.

Konstantin Mischaikow, Global dynamics of attractors for some dissipative systems, 17.6.93

Yu. I. Karlovich, Convolution type operators with oscillating coefficients and presymbols, Part I: Invertibility, 18.6.93.

Konstantin Mischaikow, Isolating neighbourhoods, the Conley index and chaotic dynamics, 24.6.93.

Yu. I. Karlovich, Convolution type operators with oscillating coefficients and presymbols, Part II: Fredholm and semi-Fredholm properties, 25.6.93.

Yu. I. Karlovich, Isomorphisms of non-local C*-algebras and their applications, 5.7.93.

José Sousa Pinto, Funções generalizadas e análise não standard, 9.7.93.

Irene Fonseca, Caracterização de medidas de Young, 13.7.93.

Àngel Calsina, Some nonlocal evolution equations occurring in biological models, 15.7.93.

Luc Tartar, A problem in micromagnetics involving H-measures and Young measures, 27.7.93.

Abraham C.-L. Chian, Turbulência de Langmuir-Alfvén no universo de plasma, 12.11.93.

Ana Barroso, Transições de fase: modelos e métodos do cálculo das variações, 14.12.93.

Naum Krupnik, Symbol calculus for algebras generated by two idempotents and a shift: applications to singular integral operators with shift, 14.12.93.

Naum Krupnik, Explicit solutions to some perturbed singular integral equations by reduction to factorization of corresponding matrix functions, 15.12.93.

Applied Mathematics and Numerical Analysis

T. Ha.-Duong, Méthodes énergétiques pour l' étude de stabilité des conditions absorbents pour l'équation des ondes en milieu hétérogène, 20.7.93.

G. P. Galdi, Mathematical problems in non-newtonian fluid mechanics, 23.9.93.

Eliane Bécache, Some theoretical and numerical results concerning the time-dependent boundary integral equation for an elastic wave scattering problem, 7.10.93.

Matthew Coleman, Analysis of the vibration spectrun of the Timoshenko Beam and the Kirchoff Plate, 15.10.93.

5. Research programmes and sponsorship

Under the Programe STRIDE, administered by JNICT, the following projects are being supported:

- Methods of Non-linear Analysis, STRD/C/CEN/92, coordinated by C. Rocha,
- Algebraic Methods on the Geometry of Discrete Dynamics, coordinated by J. M. Ferreira,
- Lógicas para Representação de Conhecimento Jurídico-Administrativo, JURAD, coordinated by J. Carmo.

In the framework of Programa Base of JNICT, the following projects are being supported:

- Operator Methods in Diffraction Theory, PBIC/CEN/1040/92, coordinated by F. S. Teixeira,
- Generalized Functions and Symbolic Calculus, coordinated by F. Viegas.

The Programa CIENCIA, administered by JNICT, is supporting the project

- Mathematical Analysis, Dynamical Systems and Applications to Engineering, coordinated by L. T. Magalhães.

Funding was approved for the "Constrained Dynamical Systems" network under the Human Capital and Mobility programme of the European Union (Contract ERB-CHRX-CT93-0362). The network is a collaboration between thirteen institutions in nine EU countries. The Portugal research team is coordinated by R. Picken. The contract is for the period 1.1.94 - 31.12.96.

Adélia Sequeira coordinates two projects approved in 1993 and starting in 1994: Problemas Matemáticos das Equações da Hidrodinâmica, Portuguese-German collaboration programme sponsored by CRUP-DAAD between the Mathematics Departments of Instituto Superior Técnico and the University of Bayreuth (collaboration nº A-10); The Equations of Fluid Mechanics and Related Topics, Human Capital and Mobility programme of the European Union (Contract ERBCHRXCT 930407).

The EC continued supporting the ESPRIT basic research action IS-CORE (Information Systems: Correctness and Reusability) coordinated by Amílcar Sernadas with the participation of nine other European universities and research centres.

The EC continued to support the participation of Amílcar Sernadas in the ESPRIT basic research action COMPASS (Comprehensive Algebraic Approach to System Specification and Development).

ESDI and DIGITAL continued supporting the project OBLOG (Object Logic) coordinated by Cristina Sernadas.

The ESPRIT basic research action MODELAGE was initiated with the participation of Mark Ryan. Mark Ryan also participates in the JNICT project JURAD.

The projects FAC3 and OBCALC financed by JNICT were successfully concluded in September 1993.

6. Personal Notes

Honours

Pedro Girão won a prize in the 1993 SIAM Student Paper Competition, with the paper: "Convergence of a crystalline algorithm for the motion of a simple closed convex curve by weighted curvature". The prize is awarded every year to graduate students who present research papers of outstanding quality in Applied Mathematics. The award took place at the 1993 SIAM Annual Meeting in Philadelphia, USA, July 1993.

New Professors and Promotions

Luís T. Magalhães was promoted to the position of "Professor Catedrático" in Sept. 93.

Adélia Sequeira joined the Department as "Professora Associada" in Numerical Analysis in Sept. 93 (formerly she was at the Universidade de Lisboa).

Francisco Teixeira, Paulo Almeida and Pedro Gonçalves Henriques were promoted to the position of "Professor Associado" in Aug. 93.

Pedro Girão, Michael Paluch, Fernando Pestana da Costa, José Matias and Cristina Câmara were promoted to the position of "Professor Auxiliar" on 29.6.93, 30.9.93, 26.11.93, 10.12.93 and 13.12.93 respectively.

Monique Moura and Mark Ryan were appointed as "Professor Auxiliar Convidado" on 29.9.93 and 1.10.93 respectively.

Other Degrees involving Members of the Department

Apart from the degrees listed in section 2, members of the department were also involved in supervising and examining a number of external degrees, as follows:

Doutoramentos/PhDs: J. Branco (1), A. Sernadas (1), C. Sernadas (4)

Equivalências de Doutoramento: J. Branco (1), L. Magalhães (2)

Mestrados/MScs: J. Branco (6), J. Carmo (1), T. Diogo (1), L. Magalhães (1), D. Paulino (1). A. Porta Nova (1), J. S. Ramos (1), A. Sernadas (1).

Other Notes

João Branco is Vice-President of the Portuguese Statistical Society.

José Carmo was a member of the program committee of the Second International Workshop on Deontic Logic in Computer science, Oslo, Norway, which took place from 6.1.94 to 8.1.94, and is a member of the organizing committee of the International Conference on Information Networks and Data Communications (INDC'94) which will be held in Madeira from 18.4.94 to 21.4.94.

Luís Dominguez lectured part of the module on "Lógicas (clássicas proposicional e de 1ª ordem)" as part of a FUNDETEC sponsored specialist training course for software designers, which was held at Rumos in Lisbon from 27.12.93 to 31.12.93.

Luís Magalhães is chairman of the organizing committee for the meeting EQUADIFF 95 to be held in Lisbon in 1995. He also became the Coordinator of the Council of Secretaries of the Complexo Interdisciplinar I, Universidade Técnica de Lisboa in October 1993 and continued during 1993 as Secretary of the Centro de Análise e Processamento de Sinais and as Associate Director of the Instituto de Sistemas e Robótica, Lisboa.

Fernanda Ramalhoto was elected an ordinary member of the International Statistical Institute in 1993. She also became a member of the Editorial Board of the European Journal of Engineering Education. She is Editor of the Proceedings of the 2nd European Forum for Continuing Engineering Education - International Cooperation between Industry and Academia, Lisbon, 1993. She is also chairperson and organizer of the Invited Session "Statistics in Continuing Education for Employees in Industry", ICOTS4, to be held in Morocco in 1994, as well as member of the Technical Programme Committee of the 5th IEEE International Workshop on Computer-Aided Modelling, Analysis and Design of Communication Links and Networks (CAMAD'94) to be held in Princeton, New Jersey, in 1994 and member of the Programme Committee of the 3rd European Forum for Continuing Engineering Education to be held in Vienna in 1994.

Roger Picken is a member of the organizing committee of the III Oporto Meeting on Knot Theory and Physics to be held in Oporto from 6.6.94 to 8.6.94. Together with Ana Bela Cruzeiro, he also organized the fortnightly seminar on Mathematical Physics held at Complexo II, University of Lisbon.

Carlos Rocha is a member of the organizing committee for the meeting EQUADIFF 95 to be held in Lisbon in 1995. He was on sabbatical leave during 1993.

Adélia Sequeira is chairman of the organizing committee of the Third International Conference on Navier-Stokes Equations and Related Nonlinear Problems, to be held in Madeira from 21.5.94 to 27.5.94, and member of the organizing committee of STAMM 94, Symposium on Trends in Applications of Mathematics to Mechanics, to be held in Lisbon from 23.7.94 to 30.7.94.

Francisco Teixeira and Francisco Viegas organised the seminar on Functional Analysis and Applications in the Mathematics Department of Instituto Superior Técnico.

Juha Videman is a member of the organizing committee of the Third International Conference on Navier-Stokes Equations and Related Nonlinear Problems, to be held in Madeira from 21.5.94 to 27.5.94.

PREPRINT SERIES

1993

1/93 KRAVCHENKO, VLADISLAV V.: On a Hypercomplex Factorization of Some Equations of Mathematical Physics. 8 pp.

2/93 KRAVCHENKO, V. G.; LITVINCHUK, G. S.: On the C*- Algebra of Singular Integral Operators with Carleman Shift on a Non-Closed arc. 12 pp.

3/93 MEISTER, E.; PENZEL, F.; SPECK, F.-O.; TEIXEIRA, F. S.: Two Canonical Wedge Problems for the Helmholtz Equation. 29 pp.

4/93 BÖHM, K.; SERNADAS, A.: An Institution of Real-Time Object Behavior. 19 pp.

5/93 BÖHM, K.; SERNADAS, A.: The Institution of the Propositional Fragment of RTOSL. 15 pp.

6/93 BÖHM, K.; SERNADAS, A.: OBLOGtime -a Graphical Specification Method for Objects with Real-Time Features. 38 pp.

7/93 BÖHM, K.; SERNADAS, A.: Real-Time Object Specification Logic. 16 pp.

8/93 KRAVCHENKO, V. G.; LEBRE, A. B.; LITVINCHUK, G. S.; TEIXEIRA, F. S.: Noether Theory for a Class of Singular Integral Operators with Carleman Shift and Unbounded Coefficients. 15 pp.

9/93 LIMA, P. M.; GRAÇA, M.: Convergence Acceleration for boundary value problems with Singularities using the E - Algorithm. 26 pp.

10/93 LI, R.; CARMO, J.: On Completeness of a Logic for Temporal Reasoning. 37 pp.

11/93 KRAVCHENKO, V. G.; LEBRE, A. B.; LITVINCHUK, G. S.; TEIXEIRA, F. S.: A Normalization Problem for a Class of Singular Integral Operators with Carleman shift and Unbounded Coefficients. 12 pp.

12/93 SERNADAS, A.; SERNADAS, C.: Denotational Semantics of Object Specification Within an Arbitrary Temporal Logic Institution. 30 pp.

13/93 CÂMARA, M. C.; SANTOS, A. F.: Generalized Factorization for a Class of nxn Matrix Functions - Partial Indices and Explicit Formulas. 33 pp.

14/93 CORDOVIL, R.; FACHADA, J. L.: Braid Monodromy Groups of Wiring Diagrams. 20 pp.

15/93 CÂMARA, M. C.; SANTOS, A. F.; BASTOS, M. A.: Generalized Factorization for Daniele-Khrapkov Matrix Functions - Partial Indices. 23 pp.

16/93 CÂMARA, M. C.; SANTOS, A. F.; BASTOS, M. A.: Generalized Factorization for Daniele - Khrapkov Matrix Functions - Explicit Formulas. 31 pp.

17/93 CARMO, J.; JONES, A.: Deontic Database Constraints and the Characterisation of Recovery. 25 pp.

18/93 LI, R.; CARMO, J.; FIADEIRO, J.: Historical Databases: A Positional Logic Perspective. 49 pp.

19/93 LI, R.; FIADEIRO, J.; CARMO, J.: Incorporating a Time Dimension into OBLOG. 42 pp.

20/93 COSTA, F. P.: Existence and Uniqueness of Density Conserving Solutions to the Coagulation-Fragmentation Equations with Strong Fragmentation. 27 pp.

21/93 PICKEN, R. F.: Non-Local Variables in Quantum Gravity and Vassiliev Invariants. 14 pp.

22/93 CAETANO, A.; PICKEN, R. F.: An Axiomatic Definition of Holonomy. 18 pp.

23/93 GRAÇA, M.; Sequence Transformations with Mathematica. 8 pp.

24/93 CARR, J.; COSTA, F. P.: Asymptotic Behaviour of Solutions to the Coagulation-Fragmentation Equations. II. Weak Fragmentation. 35 pp.

25/93 COSTA, F. P.: On the Positivity of Solutions to the Smoluchowski Equations. 11 pp.

26/93 AIZENSHTAT, A. V.; KARLOVICH, Yu. I.; LITVINCHUK, G. S.: The Method of Conformal Gluing for the Haseman Boundary Value Problem on an Open Contour. 35 pp.

27/93 OLIVA, W.; KUHL, N. M.; MAGALHÃES, L. T.: Diffeomorphisms of R^n with Oscillatory Jacobians. 35 pp.