

# CURRICULUM VITAE

**Rafael Bru**

## Personal Data

Home address: Cronista Chabret 23, 46500 Sagunto, Valencia, Spain.  
Citizenship: Spain.

## Education

B.S. 1973 Universidad Politécnica de Valencia, Spain.  
Ph.D. 1980 Universidad Politécnica de Valencia, Spain.

## Appointments

1975–77 Fellow, Institut Agronomique Mediterranéen, France.  
1978–82 Assistant Professor, Universidad Politécnica de Valencia.  
1982–92 Associate Professor, Universidad Politécnica de Valencia.  
1991 Associate Professor, University of Connecticut, CT, USA.  
1993– Full Professor, Universidad Politécnica de Valencia.  
2002–2005 Adjoint Professor, Curtin Univ. of Technology, WA, Australia.

## Visiting Positions

1986 Visiting Research, Univ. of Connecticut, CT, USA, (12 months).  
1988 Visiting Research, Univ. of Connecticut, CT, USA, (3 months).  
1989 Visiting Research, College of William and Mary, VA, USA, (3 months).  
1991 Visiting Associate Professor, Univ. of Connecticut, CT, USA, (6 months).  
1995 Visiting Research, Univ. of Bielefeld, Germany, (1 month).  
1997 Visiting Research, Univ. of Colorado, CO, USA, (3 months).  
2000 Visiting Professor, Curtin Univ. of Technology, WA, Australia, (1 month).  
2001 Visiting Professor, Curtin Univ. of Technology, WA, Australia, (1 month).  
2003 Visiting Professor, Curtin Univ. of Technology, WA, Australia, (1 month).  
2005 Visiting Research, Univ. Padova, Italy, (1 month).  
2009 Visiting Research, National Institute of Informatics, Tokyo, Japan, (2 weeks)

## Societies

Society for Industrial and Applied Mathematics.  
International Linear Algebra Society, (member of the Board of Directors, 2003–2005).  
Sociedad Española de Matemática Aplicada, (member of the Board of Directors, 1997–1999 and 2005–2008).

## Research Field

Nonnegative matrices.  
Numerical linear algebra.  
Control Theory.

## Grants

- 1985 “Mathematical System Theory”  
Acción Integrada Hispano-Luso
- 1989–91 “Parallel Algorithms of Matrix Computations”  
Comisión Interministerial Ciencia y Tecnología: CICYT
- 1990–91 “Implementation of Parallel Matrix Algorithms on  
Distributed Memory Multiprocessors”  
Comisión Interministerial Ciencia y Tecnología: CICYT
- 1991–1993 “Parallel Matrix Computation”  
Comisión Interministerial Ciencia y Tecnología: CICYT
- 1992–1994 “Dynamical Discrete-Time Linear Periodic Systems”  
Dirección General de Investigación Ciencia y Tecnología: DGICYT
- 1993–1996 “Foundations of General Purpose Parallel Computing”  
ESPRIT program # 9072 of EU
- 1995–1998 “Rational Matrix: Application to the Study  
of Discrete-Time Linear Periodic Systems”  
Dirección General de Investigación Científica y Tecnológica: DGICYT
- 1996 “Estudio del coste e implementación de algoritmos  
numéricos en paralelo para sistemas lineales”  
Comisión Interministerial Ciencia y Tecnología: CICYT
- 1997 “Estudio e implementación de algoritmos para la  
Resolución en paralelo de sistemas de ecuaciones”  
Comisión Interministerial Ciencia y Tecnología: CICYT
- 1998-2001 “Problemas matriciales de sistemas de ecuaciones lineales  
y de sistemas de control discretos lineales”  
Dirección General de Enseñanza superior: DGES
- 2001-2004 “Sistemas lineales de control positivos”  
Dirección General de Investigación: DGI, BFM2001–2783
- 2001-2004 “Métodos iterativos y preconditionadores paralelos  
para resolver sistemas de ecuaciones lineales”  
Dirección General de Investigación: DGI, BFM2001–2641
- 2004-2007 “Métodos iterativos y preconditionadores paralelos para resolver sistemas de ecuaciones lineales”  
Dirección General de Investigación: DGI, MTM2004-02998
- 2004-2007 “Modelización matemática de problemas agroambientales”  
Dirección General de Investigación: DGI, AGL2004-03263/AGR
- 2005-2006 “Estudio de problemas agroambientales mediante técnicas de modelización matemática”  
Universidad Politécnica de Valencia
- 2007-2010 “Análisis matricial, matices no negativas y aplicaciones”  
Dirección General de Investigación: DGI, MTM 2007-64477

## Editor, Reports, books and chapters

1. (With J. Vitoria) Editor, “Conference Report of IV International Conference on Linear Algebra and its Applications”, Linear Algebra and its Applications, 121, 537–710, 1989.

2. (With J. Vitoria and G. de Oliveira) Editor, “Conference Report of Encuentro de Analisis Matricial y Aplicaciones”, *Linear Algebra and its Applications*, 170, 147–280, 1992.
3. R. Bru, J.J. Climent, J. Mas and A. Urbano, “Algebra Lineal”, Vol. I, no. 98.722 and Vol. II, no. 98.713, Univ. Politécnic de Valencia, 1998, (segunda edición).
4. R. Bru, C. Coll, E. Sánchez and S. Romero, “Some problems about structural properties of positive descriptor systems”, in *Positive systems* (L. Benvenuti, A. De Santis and L. Farina Eds.), *Lectures Notes in Control and Information Sciences*, 294: 233–240, Berlin, Springer, 2003.
5. R. Bru, B. Cantó, S. Kostova and S. Romero, “Positive equilibrium points of positive discrete-time systems”, in *Positive systems* (C. Commault and N. Marchand Eds.) *Lectures Notes in Control and Information Sciences*, 341: 81–88, Berlin, Springer, 2006.
6. R. Bru and J.M. Peña, Editor of the special issue on “Numerical and Applied Linear Algebra”, *Advances in Computational Mathematics*, 2009.
7. R. Bru and S. Romero, Editor of *Lectures Notes in Control and Information Sciences*, Vol. 389, Conference Proceedings of the Symposium on Positive Systems Theory and Applications: POSTA09 2009.
8. R. Bru, Member of the Editorial Board of *Advances in Engineering Software*, March 2009-present.

## Papers

1. R. Bru and M. López Pellicer. “Extensions of Algebraic Jordan Basis”. *Glansnik Matematicki*, 20(40):289–292, 1985.
2. M. López Pellicer and R. Bru. “Jordan Basis for an Infinite Dimensional Vector Space”. *Portugaliae Mathematica*, 43:153–156, 1985.
3. R. Bru, L. Elsner and M. Neumann. “Models of Parallel Chaotic Iteration Methods”. *Linear Algebra and its Applications*, 103:175–192, 1988.
4. R. Bru and M. Neumann. “Nonnegative Jordan Basis”. *Linear and Multilinear Algebra*, 23(2):95–109, 1988.
5. R. Bru and R. Fuster, “Convergence of Parallel Extrapolated Jacobi Method”, *Linear Algebra and its Applications*, 120:252–256, 1989.
6. R. Bru and V. Hernández. “Structural Properties of Discrete-Time Linear Positive Periodic Systems”. *Linear Algebra and its Applications*, 121:171–183, 1989.
7. C. Johnson and R. Bru. “The Spectral Radius of a Product of Nonnegative Matrices”. *Linear Algebra and its Applications*. 141:227–240, 1990.
8. R. Bru and R. Fuster, “Parallel Chaotic Relaxed Jacobi Method”. *Applied Mathematics Letters*, vol. 3(4):65–69, 1990.
9. R. Bru, L. Rodman and H. Schneider. “On Marked Invariant Subspaces”. *Linear Algebra and its Applications*, *Linear Algebra and its Applications*, 150:209–225, 1991.
10. E. Sanchez, V. Hernández and R. Bru, “Minimal Realization for Discrete-Time Linear Periodic Systems”, *Linear Algebra and its Applications*, 162:685–708, 1992.
11. R. Cantó and R. Bru, “On Rothblum and Preferred Bases for the Generalized Eigenspace of the Spectral Radius of a Nonnegative Matrix”. *Proceedings of Encuentro de Analisis Matricial y Aplicaciones*, *Linear Algebra and its Applications*, 170:159–164, 1992.

12. C. Coll, R. Bru and V. Hernández, “Nonnegative Holdability and Stabilizability of Discrete–Time Linear Periodic Systems”, Proceedings of Encuentro de Análisis Matricial y Aplicaciones, Linear Algebra and its Applications, 170:164–169, 1992.
13. E. Sánchez, V. Hernández, and R. Bru, “Hankel Matrices for Discrete–Time Linear Periodic Systems”, Proceedings of Encuentro de Análisis Matricial y Aplicaciones, Linear Algebra and its Applications, 170:262–267, 1992.
14. R. Bru and C. Johnson. “Nilpotence of Products of Nonnegative Matrices”. The Rocky Mountains Journal of Mathematics, 23(1): 1–12, 1993.
15. R. Bru, R. Cantó and B. Tam “Predecessor Property, Full Combinatorial Column rank, and the Height Characteristic of an  $M$ –matrix, Linear Algebra and its Applications, 183:1–22, 1993.
16. R. Bru, J. Mas and A. Urbano. “An Algorithm for the Single Input Pole–Assignment Problem”. SIAM Journal on Matrix Analysis and Applications, 15(2):393–407, 1994.
17. R. Bru, J. Cerdán and A. Urbano, “A Parallel Algorithm for the Multi–input Eigen–assignment Problem”, Linear Algebra and its Applications, 199:427–444, 1994.
18. R. Bru, J. Cerdán P. Fernández de Cordoba and A. Urbano, “A Parallel Algorithm for the Partial Single–input Pole Assignment Problem”, Applied Mathematics Letters, 7(3):7–11, 1994.
19. R. Bru and R. Cantó, “On Nonnegative Jordan Chains for the Generalized Nullspace of a Singular  $M$ –Matrix”, Linear and Multilinear Algebra, 36:267–274, 1994.
20. C. Coll, R. Bru, V. Hernández and E. Sánchez, “Discrete–Time Linear Periodic Realizations in the Frequency Domain”, Linear Algebra and its Applications, 203:301–316, 1994.
21. C. Coll, R. Bru, and V. Hernández, “Generalized Bezoutian for a Periodic Collection of Rational Matrices”, Kybernetika, 30(4):393–402, 1994.
22. R. Bru, L. Elsner and M. Neumann, “Convergence of Infinite Products of Matrices and Inner–Outer Iteration Schemes”, Electronic Transactions of Numerical Analysis, 2:183–193, 1994.
23. R. Bru, J.J. Climent and M. Neumann, “On the Index of Block Upper Triangular Matrices”, SIAM J. on Matrix Analysis and Appl., 16(2):436–447, 1995
24. R. Bru, C. Corral, A. Martinez and J. Mas, “Multisplitting Preconditioners Based on Incomplete Choleski Factorizations”, SIAM Journal on Matrix Analysis and Applications, 16(4):1210–1222, 1995.
25. R. Bru, C. Corral y J. Mas, “A Preconditioned Conjugate Gradient method on a Distributed Memory Multiprocessor”, Applied Mathematics Letters, 8(3):49–53, 1995.
26. R. Bru, V. Migallón, J. Penadés and D. Szyld, “Parallel, Synchronous and Asynchronous Two–Stage Multisplitting Methods”, Electronic Transactions of Numerical Analysis, 3:24–38, 1995.
27. R. Bru, V. Migallón and J. Penadés, “Chaotic Methods for the Paraller Solution of Linear Systems”, Computing Systems in Engineering, 6(4/5):385–390, 1995.
28. R. Bru, J.J. Climent and C. Johnson, “On the Perron Eigenvalue of a Block Cocyclic Pair of Nonnegative Matrices”, Linear Algebra and its Applications, 236:231–243, 1996.
29. R. Bru, C. Coll and J. Gelonch, “Coprime Factorizations of a Collection of Rational Matrices”, Electronic Linear Algebra, 1:44–58, 1996.
30. R. Bru, C. Coll, V. Hernandez and E. Sánchez, “Geometrical Conditions for the Reachability of Discrete–Time Linear Periodic Positive Systems”, Linear Algebra and its Applications, 256:109–124, 1997.

31. D. Ginestar, G. Verdú, R. Bru, J. Marín, and J.L. Muñoz-Cobo, “High order backward discretization of the neutron diffusion equation”, *Annals of Nuclear Energy*, Vol. 25, No1–3, pp 47–64, 1998.
32. R. Bru, R. Cantó and J.J. Climent, “On  $M$ -Multisplittings of Singular  $M$ -Matrices and Markov Chains”, *Numerical Linear Algebra and Applications*, 5:299–311, 1998.
33. R. Bru, J.M. Carrasco and L.C. Paraíba, “Unsteady state fugacity model by a dynamic control system”, *Applied Mathematical Modelling*, 22:484–494, 1998.
34. R. Bru and N. Thome, “Group Inverse and Group Involutory Matrices”, *Linear and Multilinear Algebra*, 45:207–218, 1998.
35. L.C. Paraíba, J.M. Carrasco and R. Bru, “Level IV Fugacity model by a continuous time control system”, *Chemosphere*, Vol. 38, No. 8, pp.1763–1775, 1999.
36. R. Bru, C. Coll and E. Sánchez, “Output feedback of forward-backward periodic systems. Stability”, *IEEE on Automatic Control*, Vol. 45, No. 2, pp. 319–323, 2000.
37. R. Bru, C. Coll and N. Thome, “Balancing singular singular discrete-time systems”, *Applied Mathematics Letters*, 13, pp. 7–13, 2000.
38. R. Bru, E. Sánchez and S. Romero, “Canonical forms of reachability and controllability of positive discrete-time control systems”, *Linear Algebra and Applications*, 310:49–310, 2000.
39. R. Bru, C. Coll and N. Thome, “Compensating periodic descriptor systems”, *Systems and Control letters*, 43:133–139, 2001.
40. L. Júdez, J.M. de Miguel, J. Mas and R. Bru, “Modelling crop production using positive mathematical programming”, *Mathematical and Computer Modelling*, 35(1/2):77–86, 2002.
41. R. Bru, C. Coll and E. Sánchez, “Structural properties of positive linear time-invariant difference algebraic equations”, *Linear Algebra and its Applications*, 349:1–10, 2002.
42. L.C. Paraíba, R. Bru y J.M. Carrasco, “Level IV fugacity model depending on temperature by a periodic control system”, *Ecological Modelling*, Vol. 147: 221–232, 2002.
43. R. Bru, C. Coll and N. Thome, “Symmetric singular linear control systems”, *Applied Mathematics Letters*, Volume 15(6): 671–675, 2002.
44. R. Bru, D. Ginestar, J. Marín, G. Verdú, T. Manteuffel and J. Mas, “Iterative Schemes for the Neutron Diffusion Equation”, *Computers and Mathematics with Applications*, 44: 1307–1323, 2002.
45. R. Bru, R.Cantó and B. Ricarte, “Modelling nitrogen dynamics in citrus trees”, *Mathematical and Computer Modelling*, 38: 975–987, 2003.
46. R. Bru, “Métodos iterativos para resolver sistemas lineales”, *Boletín de la Sociedad Española de Matemática Aplicada*, 24: 9–29, 2003.
47. R. Bru, C. Cerdán, J. Marín and J. Mas, “Preconditioning sparse non-symmetric linear systems with the Sherman–Morrison formula”, *SIAM J. on Scientific Computing*, 25(2):701–715, 2003.
48. R. Bru, C. Coll and N. Thome, “Gramian matrices and balanced model of generalized systems”, *Applied Mathematics and Computation*, 148(2): 341–350, 2004.
49. R. Bru, C. Coll, E. Sánchez and S. Romero, “Reachability indices of positive linear systems”, *Electronic Linear Algebra*, 11: 88–102, 2004.
50. R. Bru, E. Sánchez and S. Romero, “Structural properties of positive periodic discrete-time linear systems: Canonical forms”, *Applied Mathematics and Computation*, 153: 697–719, 2004.

51. R. Bru, F. Pedroche and D. B. Szyld, “Overlapping Additive and Multiplicative Schwarz Iterations for H-matrices”, *Linear Algebra and its Applications*, 393: 91–105, 2004.
52. R. Bru, L. Caccetta and V.G. Rumchev, “Monomial subgraphs of reachable and controllable positive discrete-time systems”, *International Journal of Applied Mathematics and Computer Science*, 15(1):159–166, 2005.
53. Rafael Bru, Francisco Pedroche and Daniel B. Szyld, “Sub-direct sums of nonsingular M-matrices and of their inverses”, *Electronic Linear Algebra*, 13:162-174, 2005.
54. R. Bru, F. Pedroche and D. B. Szyld, “Additive Schwarz iterations for Markov chains”, *SIAM J. on Matrix Analysis and Applications*, 27(2):445–458, 2005.
55. Lucinio Júdez, Carolina Chaya, José María de Miguel and Rafael Bru “Stratification and Sample Size of Data Sources for the Agricultural Mathematical Programming Models”, *Mathematical and Computer Modelling*, 43:530–535, 2006.
56. L. Bergamaschi, R. Bru, A. Martinez and M. Putti “Quasi-Newton Preconditioners for the Inexact Newton Method”, *Electronic Transactions on Numerical Analysis*, 23, 76–87, 2006.
57. R. Bru, F. Pedroche and D. B. Szyld, “Sub-direct sums of S-strictly diagonally dominant matrices”, *Electronic Journal of Linear Algebra*, 15: 201–209, 2006.
58. Esteban Bailo, Rafael Bru, Josep Gelonch and Sergio Romero, “On the reachability index of positive 2-D systems”, *IEEE on Transactions Circuits and Systems II*, 53(10):997–1001, 2006.
59. R. Bru, R. Cantó, B. Ricarte and V. Rumchev, “A basic canonical form of discrete-time compartmental systems”, *International Journal of Contemporary Mathematical Sciences*, 2(6): 261 - 273, 2007.
60. Rafael Bru, Cristina Corral, Isabel Gimenez and José Mas, “Classes of general H-matrices”, *Linear Algebra and its Applications*, 429: 2358-2366, 2008. DOI: 10.1016/ j.laa.2007.10.030
61. Rafael Bru, José Marín, José Mas and Miroslav Tuma, “Balanced incomplete factorizations”, *SIAM J. on Scientific Computing*, 30(5): 2302–2318, 2008. DOI: 10.1137/070696088
62. W.A. Contreras, D. Ginestar, L.C. Parafba and R. Bru, “Modelling the pesticide concentration in rice field by level IV fugacity model coupled with a dispersion-advection equation”, *Computers & Mathematics with Applications*, 56: 657–669 2008. DOI:10.1016/j.camwa.2008.01.009
63. Rafael Bru, Sergio Romero-Vivó, and Elena Sánchez, “Reachability Indices of Periodic Positive Systems via Positive Similarity”, *Linear Algebra and its Appl.*, 429: 1288–1301, 2008. DOI: 10.1016/j.laa.2008.01.033
64. Rafael Bru, Ljiljana Cvetković, Vladimir Kostić and Francisco Pedroche, “Sums of  $\sum$ -strictly diagonally dominant matrices”, *Linear and Multilinear Algebra*, 58(1):75 - 78, 2010. DOI: 10.1080/03081080802379725  
First Published on: 02 January 2009
65. W.A. Contreras, A.L. Lidón, D. Ginestar, R. Bru, “ Compartmental model for nitrogen dynamics in citrus orchards”, *Mathematical and Computer Modelling*, 50(5-6):794–805, 2009. Online publication complete: 30-MAY-2009. DOI: 10.1016/j.mcm.2009.05.008
66. Rafael Bru, Cristina Corral, Isabel Gimenez and José Mas, “Schur complement of general H-matrices”, *Numerical Linear Algebra and Applications*, 16:935–947, 2009. DOI: 10.1002/nla.668
67. Rafael Bru, Ljiljana Cvetković, Vladimir Kostić y Francisco Pedroche, “Characterization of alpha 1 and alpha 2-matrices”, *Central European Journal of Mathematics*, 8(1):32-40, 2010.
68. Rafael Bru, Ljiljana Cvetković, Vladimir Kostić and Francisco Pedroche, “A simple generalization of Gersgorin’s theorem”, *Advances in Computational Mathematics*, to appear, 2009. DOI: 10.1002/nla.668

69. L. Bergamaschi, R. Bru, A. Martinez and M. Putti "Preconditioners for the Nonlinear Two-Phase Flow Equation in Porous Media", to appear, 2010, Advances in Engineering Software.
70. Rafael Bru, José Marín, José Mas and Miroslav Tuma, "Improved balanced incomplete factorizations", SIAM J. on Matrix Analysis, accepted, 2010.
71. L. Bergamaschi, R. Bru, and A. Martínez, "Low-rank update of preconditioners for the inexact Newton method", submitted, 2010.

## Conference Papers

1. R. Bru and J. Mas, “Extensión de un Sistema Maximal de Vectores Propios a Bases de Jordan”, 150–154, Eds. J.M. García, Universidad País Vasco, 1984, Vitoria, Spain.
2. C. Coll, R. Bru, and V. Hernández, “Estabilizabilidad no Negativa de Sistemas Lineales Dinámicos Discretos”. Proceedings of XI Congreso de Ecuaciones Diferenciales y Aplicaciones. I Congreso de Matemática Aplicada, 159–199, 1989, Malaga, Spain.
3. R. Bru, J. Duato, A. González, J. Más and A. Urbano “Performance Evaluation of a Parallel Algorithm for Inverting Dense Matrices on Distributed Memory Multiprocessors”, Four Conference on Hypercubes, Concurrent Computers and Applications, vol. 1:647–650, 1989, Monterey,CA, USA.
4. E. Sánchez, V. Hernández, and R. Bru, “Realizaciones de Sistemas Periodicos Discretos”, Proceedings of XI Congreso de Ecuaciones Diferenciales y Aplicadas. I Congreso de Matemática Aplicada, 509–513, 1989, Malaga, Spain.
5. R. Bru, J.Mas and A. Urbano, “Un Algoritmo para el Problema de Asignación de Polos en el Caso de Entrada–Simple”, Proceedings of I Congreso de Métodos Numéricos en Ingeniería, 276–282, 1990, Gran Canaria, Spain.
6. C. Coll, R. Bru, and V. Hernández, “Realizaciones de Matrices Racionales en Sistemas Lineales Periódicos Discretos”. Proceedings of XII Congreso de Ecuaciones Diferenciales y Aplicaciones. II Congreso de Matemática Aplicada, 319–324, 1991, Oviedo, Spain.
7. C. Coll, R. Bru and V. Hernández, “Generalized Bezoutian for Discrete–Time Linear Periodic Systems”, Proceedings of 2nd IFAC Workshop on System Structure and Control, 36–39, 1992, Prague, Rep. Checa.
8. R. Bru, C. Corral and J. Mas, “Overlapping Multisplitting Preconditioners for the Conjugate Gradient Method”, Proceedings of The Sixth SIAM Conference on Parallel Processing for Scientific Computing,(2):660–663, 1993, SIAM, Philadelphia, USA.
9. E. Sánchez, V. Hernández and R. Bru, “Nonnegative Periodic Realization of Nonnegative Discrete–Time Linear Periodic Systems”, ECC’93 2nd. European Control Conference, (4): 1809–1813, 1993, Groningen, The Netherlands.
10. R. Bru, J. Cerdán and A. Urbano, “Un algoritmo paralelo para el problema de asignación parcial de polos en el caso de entrada múltiple”, Actas del II Congreso de Métodos Numéricos en Ingeniería, 930–936, 1993, La Coruña, Spain.
11. R. Bru, C. Corral and J. Mas, “Evaluación y prestaciones de preconditionadores paralelos sobre un multiprocesador con memoria compartida”, Actas del II Congreso de Métodos Numéricos en Ingeniería, 1062–1070, 1993, La Coruña, Spain.
12. R. Bru, V. Migallón and J. Penadés, “Chaotic inner–outer iterative schemes”, Fifth SIAM Conference on Applied Linear Algebra, 434–438, 1994, SIAM, Philadelphia, USA.
13. R. Bru, C. Coll and V. Hernández, “Problems on Discrete–Time Periodic Realization of a Periodic Collection of Rational Matrices”, 1st IFAC Workshop on New trends in Design of Control Systems, 347–351, 1994, Smolenice, Eslovaquia.
14. R. Bru, J.M. Carrasco and L.C. Paraíba, “Modelización de la fugacidad por un sistema de control dinámico”, Encuentro de Análisis Matricial y Aplicaciones, EAMA-97, 72–79, Sevilla, Spain.
15. R. Bru, C. Coll, V. Estruch and E. Sánchez, “Feedback for Singular Discrete–Time Linear Periodic Systems”, Encuentro de Análisis Matricial y Aplicaciones, EAMA-97, 80–86, Sevilla, Spain.



16. R. Bru, D. Ginestar, J. Marín, G. Verdú and V. Vidal, “A Second Degree Method for the Neutron Diffusion Equation”, Encuentro de Análisis Matricial y Aplicaciones, EAMA-97, 87–93, Sevilla, Spain.
17. R. Bru, S. Romero and E. Sánchez, “Forma canónica alcanzable de sistemas de control periodicos positivos”, Encuentro de Análisis Matricial y Aplicaciones, EAMA-97, 94–100, Sevilla, Spain.
18. R. Bru and N. Thome, “Representaciones de la inversa de grupo de una matriz cuadrada”, Encuentro de Análisis Matricial y Aplicaciones, EAMA-97, 101–108, 1998, Sevilla, Spain.
19. R. Bru, S. Romero and E. Sánchez, “On Reachability and Controllability of Periodic Positive Discrete-Time Linear Systems”, Mathematical Theory of Networks and Systems, 101–104, 1998, Padova, Italy.
20. R. Bru, C. Coll and N. Thome, “Compensadores periódicos para modelos singulares”, VIII Reunión de trabajo en procesamiento de la información y control, 206–214, 1999, Mar de Plata, Argentina.
21. R. Bru, S. Romero and E. Sánchez, “Propiedades espectrales de sistemas de control positivos alcanzables”, VI Congreso de Matemática Aplicada (XVI CEDYA), 673–679, 1999, Gran Canaria, Spain,
22. R. Bru, C. Coll and N. Thome, “Aplicación de la inversa de grupo a los sistemas de control”, VI Congreso de Matemática Aplicada (XVI CEDYA), 963–970, 1999, Gran Canaria, Spain,
23. R. Bru, S. Romero and E. Sánchez, “Realimentaciones para sistemas periódicos positivos”, VII Congreso de Matemática Aplicada (XVII CEDYA), CD-Rom, ISBN: 84-699-6144-6, 20001, Salamanca, Spain.
24. R. Bru, C. Coll and E. Sánchez, “Sobre la alcanzabilidad y observabilidad de sistemas singulares”, VII Congreso de Matemática Aplicada (XVII CEDYA), CD-Rom, ISBN: 84-699-6144-6, 20001, Salamanca, Spain.
25. R. Bru, C. Coll and N. Thome, “Matrices Grammian para sistemas singulares de control”, VII Congreso de Matemática Aplicada (XVII CEDYA), CD-Rom, ISBN: 84-699-6144-6, 20001, Salamanca, Spain.
26. F. Pedroche, J. Mas and R. Bru, “Una aplicación numérica del método de McWorter y Meyers para el cálculo de bases de Jordan”, VII Congreso de Matemática Aplicada (XVII CEDYA), CD-Rom, ISBN: 84-699-6144-6, 2001, Salamanca, Spain.
27. R. Bru, L. Caccetta, E. Sánchez, S. Romero and V. Rumchev, “Recent developments in reachability and controllability of positive linear systems”, 15th IFAC world Congress, ISBN: 008044184X, 2002, Barcelona, Spain.
28. R. Bru, L. Caccetta and V. Rumchev, “Monomial decomposition of reachable and controllable positive systems”, 2002 American Control Conference, CD-Rom, ISBN: 0-7803-7298-0, 2002, Anchorage, Alaska, USA.
29. R. Bru, R. Cantó and B. Ricarte, “Sistemas compartimentales: Modelización de la dinámica del nitrógeno”, VIII Congreso de Matemática Aplicada (XVIII CEDYA), CD-Rom, ISBN: 84-930923-2-0, September, 2003, Tarragona, Spain.
30. R. Bru F. Pedroche and D.B. Szyld, “Cálculo del vector PAGERANK DE GOOGLE mediante el método aditivo de Schwarz”, Métodos Numéricos en Ingeniería (SEMNI), 4–7 July, CD-Rom, Granada, 2005.
31. R. Bru F. Pedroche and D.B. Szyld, “Subdirect sums of M-matrices”, IX Congreso de Matemática Aplicada (XIX CEDYA), CD-Rom, September, 2005, Leganés, Spain.
32. R. Bru, J. Marín and J. Mas, “Updating invertible matrices by rank one matrices”, IX Congreso de Matemática Aplicada (XIX CEDYA), CD-Rom, September, 2005, Leganés, Spain.
33. R. Bru, C. Corral, I. Gimenez and J. Mas, “Determinación de  $H$ -matrices”, X Congreso de Matemática Aplicada (XX CEDYA), CD-Rom, September, 2007, Sevilla, Spain.

34. R. Bru, L. Cvetkovic, V. Kostic, y F. Pedroche, "On the intersection of the classes of doubly diagonally dominant matrices and S-strictly diagonally dominant matrices", X Congreso de Matemática Aplicada (XX CEDYA), CD-Rom, September, 2007, Sevilla, Spain.
35. L. Bergamaschi, R. Bru, A. Martinez and M. Putti, "Quasi-Newton Preconditioners for the Solution of Large Nonlinear Systems in Porous Media", The Sixth International Conference on Engineering Computational Technology, CD-Rom, September, 2008, Athens, Greece.

## Thesis Students

Rafael Cantó, 1990, Univ. Politécnic de Valencia, Valencia, Spain.

Elena Sanchez, 1991, Univ. de València, Estudi General, Valencia, Spain.

Joan Josep Climent, 1993, Univ. Politécnic de Valencia, Valencia, Spain.

Carmen Coll, 1993, Univ. de València, Estudi General, Valencia, Spain.

Violeta Migallón, 1993, Univ. de Alicante, Alicante, Spain.

Juana Cerdán, 1995, Univ. Politécnic de Valencia, Valencia, Spain.

Cristina Corral, 1995, Univ. Politécnic de Valencia, Valencia, Spain.

Lourival Costa Parafba, 1999, Univ. Politécnic de Valencia, Valencia, Spain.

Nestor Thome, 2000, Univ. Politécnic de Valencia, Valencia, Spain.

Jose Marín, 2000, Univ. Politécnic de Valencia, Valencia, Spain.

Sergio Romero, 2001, Univ. Politécnic de Valencia, Valencia, Spain.

Wilson Alberto Contreras Espinosa, 2008, Univ. Politécnic de Valencia, Valencia, Spain.

Maria Valles, 2009, Univ. Politécnic de Valencia, Valencia, Spain.

## Organizing and Programme Commitees

Member of the Organizing Committee of the IV International Conference on Linear Algebra and Applications, 1987, Valencia, Spain.

Member of the Organizing and Programme Committee of Encuentro de Análisis Matricial y Aplicaciones, 1989, Valencia, Spain.

Member of the Organizing Committee of Jornadas de Computación en Paralelo, 1989, Valencia, Spain.

Member of the Organizing Committee of Summer-School on Parallel Numerical Algorithms, Peniscola, 1994, Spain.

Member of the Programme Committee of II Encuentro de Análisis Matricial y Aplicaciones, 1994, Vitoria-Gasteiz, Spain.

Member of the Programme Committee of III Encuentro de Análisis Matricial y Aplicaciones, 1997, Sevilla, Spain.

Member of the Organizing Committee of ILAS Conference, 1999, Barcelona, Spain.

Member of the Programme Committee of I Jornades de investigació i foment de la multidisciplinar, Departament de Matemàtica Aplicada, UPV, 1999, València, Spain.

Member of the Programme Committee of II Jornades de investigació i foment de la multidisciplinar, Departament de Matemàtica Aplicada, UPV, 2000, València, Spain.

Member of the Programme Committee of II Jornades de investigació i foment de la multidisciplinar, Departament de Matemàtica Aplicada, UPV, 2001, València, Spain.

Organizer of the invited session on Positive Control Systems. 15th Triennial World Congress of IFAC, Barcelona, 2002, España.

Member of the Programme Committee of First Multidisciplinary International Symposium on Positive Systems, Rome, 2003.

Organizer of the invited session on Nonnegative Matrices. First Multidisciplinary International Symposium on Positive Systems: Theory and Applications, 2003, Rome, Italy.

Organizer of the invited session on Reachability and Controllability Systems. First Multidisciplinary International Symposium on Positive Systems: Theory and Applications, 2003, Rome, Italy.

Member of the editorial Board of The fifth International Conference on Engineering Computational Technology, 2006, Las Palmas de Gran Canarias, Spain.

Organizer of the invited session on Numerical and Computational Linear Algebra. The Fifth International Conference on Engineering Computational Technology, 2006, Las Palmas de Gran Canaria, Spain.

Member of the Organizing Committee of 15-th ILAS Conference, 2008, Cancún, México.

Member of the editorial Board of The six-th International Conference on Engineering Computational Technology, 2008, Athens, Greece.

Organizer of the invited session on Numerical and Computational Linear Algebra. The Sixth International Conference on Engineering Computational Technology, 2008, Athens, Greece.

Member of the Programme Committee (Chair) of Positive Systems and Applications (POSTA-09), 2009, Valencia, Spain.

Member of the Programme Committee (Chair) of ALAMA meeting (ALAMA-10), 2010, Valencia, Spain.

Member of the editorial Board of The seven-th International Conference on Engineering Computational Technology, 2010, Valencia, Spain.

Organizer of the invited session on Numerical and Computational Linear Algebra. The Sixth International Conference on Engineering Computational Technology, 2010, Valencia, Spain.

## **Invited Talks**

IV Haifa Matrix Theory Conference, 1988, Haifa, Israel.

Jornadas de Computación en Paralelo, 1989, Valencia, Spain.

VI Haifa Matrix Theory Conference, 1990, Haifa, Israel.

II SIAM Conference on Linear Algebra, Signals, Systems and Control, 1990, San Francisco, USA.

II ILAS Conference on Linear Algebra, 1992, Lisbon, Portugal.

III SIAM Conference on Linear Algebra, Signals, Systems and Control, 1993, Seattle, USA.

IV ILAS Conference on Linear Algebra, 1994, Rotterdam, Holland.

1st IFAC Workshop on New trends in Design of Control Systems, 1994, Smolenice, Eslovaquia.

Summer-School on Parallel Numerical Algorithms, 1994, Peñiscola, Spain.

Workshop on Applied Linear Algebra in honor of Ludwig Elsner, 1999, Bielefeld, Germany.

Nonnegative matrices,  $M$ -matrices and applications Oberwolfach Meeting, 2000, Oberwolfach, Germany.

Conference on Advances in Communication and Control Conference (COMCON 8), Crete, Greece, 2001.

The 2002 American Control Conference, Anchorage, Alaska, USA.

13TH International Workshop on Matrices and Statistics, 19-21 August, 2004, Poznan, Poland.

MAT-TRIAD 2005. 3-5 March, 2005, Bedlewo, Poland.

Applied Linear Algebra Conference (ALA-06), October, 2006, Palić, Serbia.

MAT-TRIAD 2007. 22-24 March, 2007, Bedlewo, Poland.

Applied Linear Algebra Conference (ALA-08), April, 2008, Novi Sad, Serbia.

The International Workshop on Numerical Analysis and Scientific Computing, 2008, Rostov-on-Don, Russia.

The Second International Conference on Numerical Algebra and Scientific Computing (NASCO8), November, 2008, Nanjing, China.

## Referee

Linear Algebra and its Applications, SIAM J. on Algebraic and Discrete Methods, SIAM J. Matrix Analysis, Proceedings of SIAM on Linear Algebra, Signals, Systems and Control, IMA Journal of Numerical Analysis, Numerical Algorithms, Numerical Linear Algebra with Applications, Mathematical Review, Zentralblatt Math, Calcolo, Systems and Control Letters, Proceedings of the American Mathematical Society, Journal of Computational and Applied Mathematics, Applied Numerical Mathematics, IEEE T. on Circuits and Systems, IEEE T. on Automatic Control, Mathematics and Computers with Simulation, Electronic Linear Algebra, Computers and Mathematics with Applications.