

Abbreviated Curriculum Vitae

RUI J. P. DE FIGUEIREDO

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1. Education

B.S. (1950) and **M.S.**(1952) in *Electrical Engineering*, M. I. T., Cambridge, Mass

Ph.D. (1959) in *Applied Mathematics*, Harvard University, Cambridge, Mass.

2. Positions Held

Jan 2006 to-date: Research Professor-(Above-Scale) of Electrical Engineering and Computer Science and of Mathematics; Director, Laboratory for Machine Intelligence and Neural and Soft Computing; California Institute for Telecommunications and Information Technology, University of California, Irvine

July 1992 to-Dec 2005: Professor (Above-Scale) of Electrical and Computer Engineering and of Mathematics, and Director, Laboratory for Machine Intelligence and Neural and Soft Computing , University of California, Irvine

July 1990-to-July 1992: Professor of Electrical and Computer Engineering and of Mathematics, University of California at Irvine

1965-1990: Professor of Electrical and Computer Engineering and of Mathematical Sciences, Rice University
1981 (Summer): Visiting Research Professor, Swiss Federal Institute of Technology E.T.H., Zurich, Switzerland

1973 (Spring): Visiting Professor of Electrical Engineering and Computer Science, University of California at Berkeley

1972-73: Visiting Professor of Mathematics and Senior Research Fellow (U.S. Army), Math. Res. Ctr., University of Wisconsin at Madison

1964-65: Visiting Assoc. Professor, University of Illinois at Urbana-Champaign

1962-64: Associate Professor, School of Electrical Engineering, Purdue University, Lafayette, Indiana

1959-62: Head, Applied Math. and Phys. Div., Nuclear Eng. Res. Ctr., Sacavem, Portugal

1955-59: Consultant, Portuguese Atomic Energy Commission

3A. Research Achievements and their Impact on Applications

Prof. de Figueiredo made pioneering contributions to the mathematical foundations of linear and nonlinear signal and image processing, which, in turn, led to the development of novel methodologies for a wide range of applications. Most of this work has been reported in about 400 publications, consisting of 3 books, 17 book chapters, and 380 papers in archival journals and reviewed conference proceedings. They are highlighted in the following five sub-sections of this document.

3A.1 Invention of a Generalized-Spline-Based Framework for Signal and Image Recovery and for Optimal Digital Simulation of Analog Systems

Prof. de Figueiredo introduced “generalized” splines into signal processing, and pioneered their use as “information-bearing objects”, rather than mere “computational objects” as done previously by the computer-oriented engineering community (see [1-2] ¹). This he achieved by deducing, from strictly mathematical arguments, (i) that the uncertainty in a smooth analog signal $y(t)$, to be estimated from its samples, can be represented by a source model which assumes $y(t)$ to be the output of a linear dynamical system driven by an unknown input $x(t)$ residing in an uncertainty ball in the input space; and (ii) that the generalized spline $S(t)$ corresponding to the differential operator associated with the source model is the optimal estimator of $y(t)$, in a min-max error sense, in an appropriate Sobolev Space, under the given interpolating or smoothing constraints. Based on this principle, (a) he and collaborators developed Generalized-Spline-based (GS) filters for recovery of signals [1] and images [2] from their (possibly noisy) samples using dynamical source models; and (b) a methodology for best approximation of an analog filter by a digital filter. We point out that such a GS filter, which uses a dynamical source model and optimizes the estimate in a min-max error sense in an approximation theory sense, is analogous to a Kalman filter which uses a dynamical source model and optimizes the estimate in a Minimum Mean Square sense in a probabilistic setting. Thus, at least conceptually, *GS filters are in the same league as the Kalman filter*.

In the above context, Prof. de Figueiredo invented the “Butterworth” and “Chebyshev” generalized splines [2] (the differential operators which generate them being those associated with Butterworth and Chebyshev filters) as a more powerful alternative to prolate spheroidal wave functions of Slepian, Landau, and Pollack (SLP approach) for the recovery of “essentially” (not ideally) band-limited signals from their samples. This is because in the SLP approach, the recovery is posed as an unconstrained optimization problem, while in the generalized spline case the interpolating or smoothing functional are included as constraints in the optimal curve fitting procedure.

Impact: This work had a significant impact on contemporary academic research (e.g., Stanford, Wisconsin, Rice) and Prof. de Figueiredo received a special invitation from Prof. I. Schoenberg, the inventor of the cubic spline, to spend a sabbatical year at the University of Wisconsin’s Math Research Center with a prestigious Army research fellowship. The underlying technology was transferred to the Johnson Space Center under a major NASA Contract NAS9-12776 to Rice University’s the Institute for Computer Services and Applications on which Prof. de Figueiredo served as Co-Pi and Research Coordinator.

3A.2 Beyond Volterra and Wiener: Optimal Modeling of Nonlinear Dynamical Systems in a Neural Space for Applications in Computational Intelligence

One of the most far-reaching contributions of Professor de Figueiredo in nonlinear mathematics, which impacted IT applications is the one in which he generalized and converted the conventional Symmetric Fock Space (used in the representation of Boson fields in quantum field theory) [4] [5] into a Reproducing Kernel Hilbert Space [which, in the name of the inventors – him and collaborators - he called de Figueiredo/Dwyer/Zyla (DDZ) space] to represent input-output maps of very high order (large-scale) nonlinear filters. He used the orthogonal projection in this nonlinear functional space to rigorously derive optimal neural network structures, capable of adjusting their *parameters, structure, and size* to *optimally adapt, learn, and evolve* in a dynamically changing environment. Furthermore he explained how the mathematical framework that he proposed could rigorously model the processes of *discovery and invention* for such networks.

Technology and its Impact: . One of the new neural networks [6] (*Best Paper Award*), which he co-invented with T. Eltoft, named CDL (Cluster-Detection-and Labeling) network has been shown to significantly outperform the best existing neural network of its class, namely the Kohonen WTA (Winner-Take-All) network, and perform well even in some cases in which the WTA network fails. Many successful applications of these networks have been made in biomedical engineering (see e.g. [7]), and in the defense and commercial sectors

3A.3 Invention of Graph-Model-Based Models for Optimal Multi-Scale Signal and Image Processing and 3D Object recognition

Prof. de Figueiredo developed a fundamental approach to *the processing signals and images as graphs rather than as vectors*.

- (i) In the case of signals (see [11], he represented symbolically a rich (complex) waveform as a tree, whose structure is uniquely determined by the relative location and values of its peaks and valleys. In his approach, tree transformations are used to reduce the size of the original tree space. In the reduced space, trees are classified by a nearest neighbor classification method using tree metrics. Theoretically, they provide the foundations for multi-scale signal processing using attributed graph theoretic concepts.

Impact: The results were very successfully applied to the classification of EKG, seismic [5], and sonar data [6].

- (ii) In the case of images (8)[9] (*Best Paper Award*), he used graphs to represent surfaces of polyhedral objects, with nodes representing faces and edges the adjacency of two faces. The features associated with a face are moment invariants obtained by contraction of the respective moment tensors. . The resultant algorithms permit not only the identification of objects independent of 3D translation, rotation, and scaling, but also their 3D orientation with respect to the direction of look.

Impact: A software package with these results was written and transferred to the NASA/JSC automation and robotics test-bed for the Space Station Freedom. Further developments, described in other papers, led to a central piece of software for space robot vision at the McDonnell Douglas Aerospace Company facility in Huntington Beach, California

3A.4 Biomedical Signal and Image Processing Applications

- (i) In collaboration with Prof. Moschytz's group at ETH, Zurich, Prof. de Figueiredo developed a novel approach to the analysis of electromyographic (EMG) signals [12].

Impact: The underlying technology led to a computer program considered by an expert (Prof. Carlo de Luca from Harvard Medical School and MIT) to be one of the two best then available for this application at that time.

- (ii) Among other applications, Prof.de Figueiredo developed a new methodology [13] for histological brain tissue color image analysis to quantify beta-amyloid growth in Alzheimer's disease , as well as a neural-network-based algorithm for early detection of Alzheimer's from Brain Spect images.

Impact: It was shown to outperform the clinical diagnostician [7].

3A.5 Telecommunications

- (i) **Digital Satellite Channel Equalizer:** Prof. De Figueiredo's group developed a new neural-network-based nonlinear equalizer for digital satellite communications, which outperformed its competition. (See [C188])
- (ii) **E-V BLAST for MIMO Wireless Communications:** His group developed and analyzed a novel enhancement for the notable Bell Labs V-BLAST algorithm for signal detection in Multi Input-Multi-Output (MIMO) antenna systems in wireless communications. This Enhanced V-BLAST (E-V-BLAST) algorithm achieves the best compromise between performance and computational complexity (see [C184] and [C191]).

- (iii) **New Pre-Distorters for Power Amplifier Linearization in OFDM-Based Wireless Communication Systems:** OFDM (Orthogonal Frequency Division Multiplexing) has several desirable attributes which make it a prime candidate for a number of emerging wireless communication standards. However, a major problem posed by OFDM is the high Peak-to-Average-Power Ratio (PAPR) in the transmitted signal, which seriously limits the output power of the power amplifier if the latter is to remain in its normal linear range. Prof. de Figueiredo's group developed a new signal pre-distortion approach, which compensates the distortion occurring in the power amplifier, thus significantly increasing its linear range and hence its output power. Computer simulations show that our pre-distorters outperform those of our competition [C190]. (A *patent* has just been obtained by the UCI OTA (Office of Technology Alliances)).

Impact: The above projects attracted support from Lucent technologies and Broadcomm

3B Principal publications pertinent to the achievements in Part 3A.

Note: only key publications representative of the achievements are listed and grouped according to them (The total number of reviewed publications of Prof. de Figueiredo is about 400)

Achievement 3A.1:

- [1] R. J. P. de Figueiredo and A. N. Netravali, "Optimal spline digital simulators of analog filters", in the Special Issue on "Active and Digital Filters," ed. by I.W. Sandberg and J.F. Kaiser, of the *IEEE Trans. on Circuit Theory*, vol. CT-18, pp. 711-717, 1971.
- [2] R. J. P. de Figueiredo, "Butterworth and Chebyshev splines," in the book *Approximation Theory*, edited by G. G. Lorentz, New York: Academic Press, 1973, pp. 341-343
- [3] G. Chen and R. J.P. de Figueiredo, "PDLg, splines defined by partial differential operators with initial and boundary value conditions" (with G. Chen), *SIAM Journal on Numerical Analysis*, vol. 27, no. 2, April 1990, pp. 519-528.

Achievement 3A.2:

- [4] R. J. P. de Figueiredo, "A generalized Fock space framework for nonlinear system and signal analysis," *IEEE Trans. on Circuits and Systems*, vol. CAS-30, no. 9, pp. 637-647, September 1983 (Special invited issue on "Nonlinear Circuits and Systems").
- [5]] R. J. P. de Figueiredo, "Beyond Volterra and Wiener: Optimal Modeling of Nonlinear Dynamical systems in a Neural Space for Applications in Computational Intelligence", in the book "*Computational Intelligence: The Experts Speak*", edited by Charles Robinson and David Fogel, volume commemorative of the 2002 World Congress on Computational Intelligence, IEEE and John Wiley & Sons, 2003.
- [6] T. Eltoft and R. J. P. de Figueiredo, "A new neural network for cluster-detection-and-labeling" (with Eltoft, T.) *IEEE Transactions on Neural Networks*, vol.9, no.5, pp. 1021-35, Sept. 1998. (**Best Paper Award**)
- [7] R. J. P. de Figueiredo, W.R. Shankle, A. Maccato, M.B. Dick, P.Y. Mundkur, I. Mena, C.W. Cotman "Neural-network-based classification of cognitively normal, demented, Alzheimer's disease and vascular dementia from brain SPECT image data" (with), *Proceedings of the National Academy of Sciences USA*, vol 92, pp. 5530-5534, June 1995.

Achievement 3A.3:

[8]B.Bamieh and R. J.P. de Figueiredo "A General Moment-Invariants/Attributed-Graph Method for 3D Object Recognition from a Single Image", *IEEE Journal of Robotics and Automation*, vol. RA-2, no. 1, pp. 31-41, March 1986.

[9]"A Framework for Automation of 3D Machine Vision," *Texas Instruments Technical Journal*, Winter 1987, pp. 62-72 (Received 1987 AAAI Conference/Texas Instruments (**Best Paper Award**)).

[10] R. J. P. de Figueiredo, "Spectral and artificial intelligence methods for seismic stratigraphic analysis" (with S.W. Shaw), in *Handbook of Geophysical Exploration*, sec. 1, Seismic Exploration, vol. 20, Pattern Recognition and Image Processing, edited by F. Aminzadeh, pp. 426-446, London-Amsterdam: Geophysical Press 1987.

[11] S. W. Shaw and R. J. de Figueiredo, "Structural Processing of Waveforms as Trees" (with S.W. Shaw), *IEEE Trans. on ASSP*, vol. 38, no. 2, February 1990, pp. 328-338.

Achievement 3A.4:

[12] R. de Figueiredo, A. Gerber, R.M.Studer, and G.S. Moschytz "A new framework and computer program for quantitative EMG signal analysis", *Centennial Issue of the IEEE Trans. on Biomedical Eng.*, vol. BME-31, pp. 857-863, December 1984.

[13]R. de Figueiredo, B.J. Cummings, P.Y. Mundkur, C.W. Cotman "Color image analysis in neuro-anatomical research: Application to senile plaque subtype quantification in Alzheimer's disease", *Neurobiology of Aging*, vol. 16, no. 2, pp. 211-223, 1995.

Achievement 3A.5:

[14] R. Oten and R. de Figueiredo, "Sampled Function Weighted Order (SFWO) Filters" , *IEEE Transactions on Circuits and Systems – II*, vol. 49, no. 1, January 2002. (TCAS **Guillemin-Cauer Best Paper Award**).

[15] S. C. Matz and R. de Figueiredo, "A Nonlinear Image Contrast Sharpening Approach Based on Munsell's s Scafe", *IEEE Trans. on Image Processing*, April 2006.

[16] B. S. Denney and R. de Figueiredo, "Scattering-Based Tomography for HRR and SAR Prediction", *J. of Multi-Dimensional Systems and Signal Processing*, V. 14, pp. 207-222, 2003.

[17] A. Bhargave, T. Eltoft, and R. de Figueiredo, "A detection algorithm for the V-BLAST system" (with.) *IEEE Global Telecommunications Conference*, 2001. GLOBECOM '01, Volume: 1, 25–29, Nov. 2001, pp. 494 – 498, vol.01 (*Invited Paper*)

4. Inventions

(a)1987 NASA Certificate of Recognition for Creative Development and Technical Innovation;

(b)1988 NASA Certificate for an Inventive Contribution;

(c) U.S. Patent No. 5,005,147 entitled "Method and Apparatus for Sensor Fusion" (with K. Krishen and S.W. Shaw) (April 2, 1991).;

(d) U.S. Patent Pending No. 10/310,236 entitled “Scatterer Modeling Using Scattering-Based Tomography” (with B. S. Denney and K. N. Estabridis) (May 16, 2003)

(e) U.S. Patent just awarded to UCI on “Nonlinear Pre-Distorters for PAPR Mitigation in OFDM” (with B-M Lee)

5. Awards and Honors

(A) Principal Non-IEEE Honors/Awards

(a) Medals

1. **Junta de Energia Nuclear**, Portugal, Medal, 1960

Citation: “For contributions to the creation of the first Lab for Nuclear Physics and Engineering”

2. **Gh. Asachi Medal**, of the Senate of Technical University of Iasi, Romania, 2003

Citation: “For contributions in developing cooperation between the faculty of this Technical University and the IEEE Circuits and Systems Society

3. **George Chilingar Medal of the Russian Academy of Natural Sciences (U.S. Branch)**, 2007

Citation: “In recognition for important contributions to sciences and engineering

(b) Academies

1. Elected member of the UN-Sponsored **International Informatization Academy**, January 2003.
2. Elected Member of the **Russian Academy of Natural Sciences (U.S. Branch)**.2007
3. **New York Academy of Sciences**, 1984-

”

(c) Major (Non-IEEE) Awards

1. 1987 Amer. Assoc. for Artificial Intelligence Conference/ Texas Instruments **Best Paper Award** For outstanding paper entitled “A Framework for Automation of 3D Machine Vision”, also published [4] in the *Texas Instruments Journal*, Winter 1987, pp. 67-72.

2. **NCR Faculty Excellence Award**, 1988

3. 1989 Instrumentation Society of America ROBEXS (Robotics and Expert Systems) Workshop Best Paper Award (Palo Alto, CA, Aug. 2-3, 1989).

4. IEEE, ISA, AIAA, Clear Lake and Houston, Texas **Technical-Educator- of- the- Year- Award**, 1990

(d) Commendations

1. Honoree at **DSP-30** Commemorative Event at Rice University to celebrate the initiators/pioneers of the Digital Signal Processing Program at Rice, February 1999.
2. **Honorary Professor of Electronics and Telecommunications** of the Technical University of Iasi, Romania, nominated and approved by the Senate of the University.
3. **Honorary Member of the Russian Popov Society**

(B) Principal IEEE Honors/Awards

(a) Medals

1. IEEE **Third Millennium Medal**, January 2000
Citation: “*In recognition and appreciation of valued services and outstanding contributions*”
2. IEEE Circuits and Systems Society **Golden Jubilee Medal**, 1999
Citation: “*In recognition of outstanding contributions to Society*”

(b) Major Awards

1. **IEEE Life Fellow Award**, 1976
2. IEEE, ISA, AIAA **Technical-Educator- of- the- Year- Award**, 1990
3. IEEE Circuits and Systems Society, **Distinguished Lecturer Award**, 1996-2001
4. IEEE Circuits and Systems Society **Technical Achievement Award**, 1994.
Citation: “*For sustained and very fundamental contributions to the analysis and applications of nonlinear circuits and systems and to spline-based algorithms for signal and image processing*”.
Description of the award: This is the second most prestigious award of the Society. It honors a person with outstanding technical contributions over a period of years within the scope of the CAS Society as documented by publications (including patents). The award is based on the general quality and originality of contributions and continuity of effort. Anyone who is a member of the CAS Society is eligible.
7. 2000 IEEE Transactions on Neural Networks **Best Paper Award**, June 2000
 For outstanding paper [10] entitled “A New Neural Network for Cluster Detection and Labeling” *IEEE Transactions on Neural Networks*, vol.9, no. 5, pp. 1021-1035, Sept. 1998.
8. IEEE Circuits and Systems Society **Mac Van Valkenburg Society Award**, 2002
Citation: “*For sustained fundamental contributions to signal and image processing and neural networks and the major impact that these contributions have had on a number of applications, as well as outstanding leadership in his field and at the level of the IEEE Circuits and Systems Society*”.
Description of the award: This is the most prestigious award of the Society. It honors a person with outstanding technical contributions in a field within the scope of the CAS Society and outstanding leadership in the field. The award is based on quality and significance of contribution and continuity of technical leadership. Anyone who is a member of the CAS Society is eligible.
9. IEEE Circuits and Systems Society **Guillemin-Cauer Best Paper Award**, 2003
 For the paper [7], co-authored with Remzi Oten, entitled “Sampled-Function Weighted Order Filters”, *IEEE Transactions on Circuits and Systems – Part II: Analog and Digital Signal Processing*, vol. 49, pp. 1-10, January 2002.
Description of the Award: Recognizes the best paper published in the *IEEE Transactions on Circuits and Systems*. The award is based on general quality, originality, contributions, subject matter and timeliness. Anyone who is an author of a paper published in the *IEEE Transactions on Circuits and Systems* during the two calendar years preceding the award is eligible.

(d) Commendations

1. Contribution to **Engineering Tomorrow**, a volume published by the IEEE Press to commemorate the Third Millennium, edited by Janie Fouke. Professor de Figueiredo was one of the fifty experts from the world-wide 350,000 invited to present their technological vision of the new century. Other contributors included Vinton E. Cerf, co-inventor of the Internet and Nobel Laureates Arno A. Penzias and Charles H. Townes.
2. **Invited Chapter** [9] in the book **“Computational Intelligence: The Experts Speak”**, edited by Charles Robinson and David Fogel, a volume commemorative of the 2002 World Congress on Computational Intelligence, published by IEEE and John Wiley and Sons, 2002

(e) Ph.D. Dissertations Awards and Honors

25. Ralph Budd Best Engineering Ph.D. Dissertation Award from Rice University (1980 Commencement) for graduate advisee Sarah A. Rajala (Dissertation no. 17);
26. Ralph Budd Best Engineering Ph.D. Dissertation Award from Rice University (1981 Commencement) for graduate advisee T. C. Chen (Dissertation no.20);
27. The Space Foundation National Excellence Recognition Award for graduate advisee Nasser Kehtarnavaz (Dissertation no. 26);
28. UC Regents' Fellowships to several graduate research advisees and the Matheson Gas Fellowship to the Graduate advisee Prashanth Mundkur, at UC Irvine, 1993 to-date.

6. Extraordinary Role as Educator

Both at Rice University where he was until 1990 and at the University of California Irvine, Professor de Figueiredo established a distinguished record as *educator*. He directed 29 Master's degree theses and 39 Ph.D. dissertations, several of which received research excellence awards. Several of his former students occupy prominent positions in industry and academia. Examples are: *in industry*, Dr. A.N. Netravali, former President of Lucent Technologies Bell Laboratories, member of NAE, and recipient of the 2001 National Medal of Technology; and *in academia*, Professors K.S. Chao (Texas Tech Univ.), N. Kehtarnavaz (Univ. of Texas, Dallas), S. Starks (Univ. of Texas, El Paso), Sarah Rajala (Associate Dean, North Carolina State Univ.), and H. Tagare (Yale Univ.).

At Rice, Professor de Figueiredo played a major role in the formulation of undergraduate and graduate curricula in signal and image processing and systems as well as of new directions of mathematical sciences. In February of 1999, he was honored by Rice University, with Professors C. S. Burrus, T. W. Parks, and Don H. Johnson, as a co-founder of the world-class DSP (Digital Signal Processing) Program at Rice at a celebration called DSP-30 in observance of the Program's 30th Anniversary. Many Rice undergraduates who benefited from his role as a teacher and advisor went on to

At UC Irvine, Professor de Figueiredo has served on important Campus committees including: in 1992-93, as Chair of the Faculty of Engineering; in 1993, as a member of the Campus Academic Planning Task Force, a blue ribbon panel, chaired by Ralph Cicerone, charged with the mission of advising the Chancellor on how to best utilize the campus resources; and in 2000, as member of the team planning the establishment of California

Institute for Telecommunications and Information Technology.

Professor de Figueiredo's extraordinary contributions to education have also been recognized by *two major awards* listed as awards numbered 2 and 4 in section 5(A)(c)..

7. Outstanding Leadership in the Field

In addition to inspiring his students, colleagues, and peers with his research work and ideas,

- (i) Professor de Figueiredo contributed to the technical leadership in his field by helping in the creation and direction of four major laboratories, namely the Laboratory for Nuclear Physics and Engineering in Portugal (1960), the Image Processing Laboratory at Rice (1978), the Cooperative Intelligent Mobile Robot Laboratory at Rice (1988) and the Laboratory for Machine Intelligence and Neural and Soft Computing at UC Irvine (1990).
- (ii) In the 1970's he served as a Research Coordinator for a major program based at Rice for providing technical support to the NASA-Johnson-Space-Center-based LANDSAT program; and in the 1980's he led the creation and served as the first Chair of a Consortium of NASA Johnson Space Center and four leading universities in Texas (University of Texas in Austin, University of Texas in Arlington, Texas A&M University, and Rice University) cooperating through a unique telerobotic network in the Space Station program.
- (iii) He also served on various panels and missions at national and international levels. These include (a) various NSF panels, (b) Position of Special Consultant and Advisor to the Council on Industrial and Scientific Research, Government of India, under the sponsorship of U.N. Development Program (1987), and (c) the recent Advisory Panel to the Minister of Science and Technology of Portugal to help in the planning of the entry of Portugal into the Presidency of the European Union in the year 2000.

8. Exceptional service and leadership contributions to the IEEE Circuits and Systems Society – Expansion of IEEE Transnational Activities in Argentina and Russia

The IEEE Circuits and Systems Society has constituted over the years the main forum through which Professor de Figueiredo disseminated his ideas to, and interacted with his peers. His extensive contributions to the Society are listed under his Short Biography and key and selected publications list attached as Appendix to this letter.

In recent years he led the IEEE Circuits and Systems Society as Vice-President for Publications in 1996, President Elect in 1997, President in 1998, and Former President since then. His actions promoted a significant expansion of the activities and growth of the Society internationally.

In particular, through his IEEE Distinguished Lecturer's travels, he energized the technical activities in South America and Russia. As consequence of these efforts, the IEEE CAS

Society Chapter in Argentina was consolidated (1997), and a new IEEE CAS Society Chapter was established in St. Petersburg, Russia in 2000. This also led to the organization and launching by him of the new 2002 IEEE First International Conference on Circuits and Systems for Communications (ICCSC '02) held in St. Petersburg, Russia on June 26-28, 2002, of which he served as Co-Chairman. This conference was a huge success and is evolving into a biennial event on circuits and systems applications to broadband and mobile wireless communications. The next conference in the series, of which Prof. de Figueiredo is again serving as Co-Chairman, was held in Moscow on June 30 – July 2, 2004. This expansion of Russian involvement in IEEE conference activities continued under the leadership of Prof. Vagan Shakhguldian, President of the Moscow Technical University of Communications and Informatics (MTUCI) and Prof. Alexander Korotkov of St. Petersburg State Polytechnic University (see for a listing of the venues of the ICCSC conferences and workshops)

9. Number of Master's thesis supervised: 27; Number of PhD dissertations supervised: 39

10. IEEE Activities and Offices

(a) Circuits and Systems Society:

Chairman, Houston Chapter of the IEEE Circuits and Systems Society (1976-90);
 Associate Editor, IEEE Trans. Circuits and Systems 1977-79;
 Chairman, Awards Committee on Prize Papers, Circuits and Systems Society, 1977;
 Representative of the Circuits and Systems Society in the IEEE Ocean Engineering Council (during the period of the Council until it became a Society);
 Representative of the Circuits and Systems Society in the IEEE Council on Robotics and Automation (during the period of the Council until it became a Society);
 General Chairman, 1980 IEEE Int'l Symposium on Circuits and Systems;
 Co-Chairman, First NSF sponsored CAS Society Workshop on Nonlinear Circuits and Systems, 1980;
 Member, Guest Editorial Board, Nov. '80 special issue on Nonlinear Circuits and Systems of the IEEE Trans. Circuits and Systems;
 Chairman, Nonlinear Circuits and Systems Technical Committee of the Circuits and Systems Society (1989-90);
 Member, Neural Networks Committee, Circuits and Systems Society (1989-);
 Member of Program Committee of various ISCAS's;
 Session Chair at various ISCAS's;
 Chairman, Faculty Advisory Committee, IEEE UCI Student Chapter (1990-1992);
 Member, Board of Governors, CAS Society (1994, 1995).
 Associate Editor, IEEE Transactions on Neural Networks (1994-1996);
 Vice-President for Publications, IEEE Circuits and Systems Society (1996);
 President Elect, IEEE Circuits and Systems Society (1997);
 President, IEEE Circuits and Systems Society (1998);
 Past President, IEEE Circuits and Systems Society (1999);
 Chair, Standing Committee for Nominations, IEEE Circuits and Systems Society (2000).
 General Co-Chair, 2002 IEEE First International Conference on Circuits and Systems for Communications, St. Petersburg, Russia, June 26-28, 2002.
 22. General Co-Chair, 2nd. IEEE First International Conference on Circuits and Systems for Communications, Moscow, Russia, June 30-July 2, 2004.

23. General Co-Chair, IEEE Emerging Technologies Workshop on Mobile Wireless Communications, St. Petersburg, Russia, June 2005.
24. Chair, Standing Committee for Nominations, IEEE Circuits and Systems Society (2000).
25. General and Founding Co-Chair, 2002 IEEE First International Conference on Circuits and Systems for Communications, St. Petersburg, Russia, June 26-28, 2002.
26. General Co-Chair, 2004 IEEE Second International Conference on Circuits and Systems for Communications, Moscow, Russia, June 30-July 2, 2004.
27. General Co-Chair, IEEE Emerging Technologies Workshop on Mobile Wireless Communications, St. Petersburg, Russia, June 2005.
28. General Co-Chair, 2006 IEEE Third International Conference on Circuits and Systems for Communications, St. Petersburg, Russia, July, 2006
29. General Co-Chair, 2008 IEEE Fourth European Conference on Circuits and Systems for Communications, Bucharest, Romania July , 2008
39. Honorary Chair, 2010 IEEE Fifth International Conference on Circuits and Systems for Communications, Belgrade, Serbia, June 30-July 2, 2004

(b) Other IEEE Activities:

Control Society: Member, Adaptive and Learning Systems Committee (1967-69), and of Program Committee of CDC-1970;

Systems, Man, and Cybernetics Society: Past member of various committees;

Robotics and Automation Society: Technical Editor for Space Applications of the IEEE Journal on Robotics and Automation (1984-89);

Ocean Engineering Society (OES): Senior Guest Editor, January 1984 special issue on Oceanic Seismic Exploration of the IEEE Journal of Ocean Engineering;

Member of ADCOM (1989-93); and General Chair of the 1991 IEEE OES Conference on Neural Networks for Ocean Engineering (August 15-17, 1991);

IEEE: Member, IEEE Delegation to the 1977 U.S.S.R. Popov Society Congress, Moscow, U.S.S.R.;

IEEE: Member, IEEE Fellow Award Committee (National) (1986-88)

Member, IEEE-USA Technology Policy Council, an IEEE body based in Washington D.C. that serves as an advisory role to U.S. Congress regarding IEEE based technologies.

11. Principal Non-IEEE Professional Activities

(a) SPIE (Society of Photo-optical Instrumentation Engineers):

Co-chair, SPIE Conferences on Space Station Automation III and IV, Cambridge, MA, Nov. 2-6, 1987 and Nov. 6-11, 1988;

Co-chair, SPIE/SPSE Int'l Conf. on Curves and Surfaces in Computer Vision and Graphics, Santa Clara, CA, Feb. 13-15, 1990;

General Chair, SPIE Conf. on Cooperative Intelligent Robotics in Space, Boston, MA, Nov. 4-9, 1990;

Co-Chair, SPIE Conf. on Cooperative Intelligent Robotics in Space II, Boston, MA, Nov. 10-15, 1991.

(b) SIAM (Society of Industrial and Applied Mathematics):

Member and Reviewer.

(c) Other Offices:

Associate Editor, Circuits, Systems, and Signal Processing, 1986-;

Editorial Board, Neurocomputing, An International Journal, 1993-;

Founding Chair, NASA/JSC Universities Space Automation & Robotics Consortium (USA/RC), consisting of Rice University, UT-Austin, Texas A & M Univ., and UT-Arlington (1989-90);

Member of several NSF panels;
 Member, Advisory Panel to Minister of Science and Technology, Portugal (1999-2000).
 Past Member, and co-editor of a book, Society of Exploration Geophysicists (SEG)

12. Select List of Books and Book Chapters

(Out of 400 publications)

12.a BOOKS (*peer reviewed*)

- [1] Concepts and Techniques in Oil and Gas Gas Exploration (co-editor and author). Tulsa, Oklahoma: Society of Exploration Geophysicists, October 1982.
 [2] Nonlinear Feedback Control Systems: An Operator Theory Approach (with G. Chen). San Diego, CA: Academic Press, 1993.

12.b BOOK CHAPTERS (*peer reviewed*)

- [3] "Design of optimal feature extractors by mathematical programming techniques." Pattern Recognition and Artificial Intelligence, (ed. C.H. Chen), New York: Academic Press, 1977, pp. 185-194.
 [4] "Butterworth and Chebyshev splines," in Approximation Theory, (edited by G. G. Lorentz), New York: Academic Press, 1973, pp. 341-343.
 [5] "Spectral and artificial intelligence methods for seismic stratigraphic analysis" (with S.W. Shaw), in Handbook of Geophysical Exploration, sec. 1, Seismic Exploration, vol. 20, Pattern Recognition and Image Processing (edited by F. Aminzadeh), pp. 426-446, London-Amsterdam: Geophysical Press 1987.
 [6] "Space Robots" (with Lyle M. Jenkins), in International Encyclopedia of Robotics Applications and Automation, J. Wiley and Sons, pp. 1626-1635, 1988.
 [7] "Optimal Interpolation and a Best Approximation Problem on a Generalized Fock Space of Analytic Functions" (with G. Chen), in Approximation Theory, VI, (ed. by C.K. Chui, et al.), New York: Academic Press, 1989, pp. 247-250.
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