

Curriculum Vitae

Professor Xiaohua Xia



05 October 2010

Prof Xia is a professor in the Electrical, Electronic and Computer Engineering Department, University of Pretoria, director of the Centre of New Energy Systems, and the director of the National Hub for the Postgraduate Programme in Energy Efficiency and Demand-side Management. He obtained his PhD degree at the Beijing University of Aeronautics and Astronautics in 1989. He was academically affiliated with the University of Stuttgart, Germany, the *Ecole Centrale de Nantes*, France, and the National University of Singapore before joining the University of Pretoria in 1998. Prof Xia is a fellow of the Institute for Electronic and Electrical Engineers (IEEE), a fellow of the South African Academy of Engineering (SAAE), and he has an A rating from the National Research Foundation (NRF). He also serves as the chair of the Technical Committee of Non-linear Systems of the International Federation of Automatic Control (IFAC). He has been an associate editor of *Automatica*, *IEEE Transactions on Circuits and Systems II*, *IEEE Transactions on Automatic Control*, and specialist editor (control) of the *SAIEE Africa Research Journal*.

Prof Xia has built his theoretical research interests around a number of research topics, roughly categorised into three classes: nonlinear feedback control and observer design, algebraic approach to nonlinear systems, and complexity and complex systems. His practical works span from conventional industrial applications, such as the control and handling of heavy-haul trains, motors, river/dam network, to a novel area of the modelling and control of biomedical systems. Since joining the University of Pretoria in 1998, Prof. Xia has published over 40 journal papers. His total publication now stands as 135, with journal journal/book chapter papers over 70. Most of his publications are of the highest quality, published in the most reputable journals and conferences in the field. His publications have been cited 463 (ISI) times (as of in April 2009), with an average citation per item of 10.29 and a highest single paper citation of 131. His top five cited journal papers were cited over 32 times (average 62). He has thus an H-index of 11 (ISI and SCOPUS). Apart from a large number of postgraduate students at the B (honors) level, he has successfully hosted over 30 visitors from all over the world, as senior research fellows, postdocs, and personnel of intergovernmental exchange programmes, (co-) supervised over 25 research students at PhD or master's levels (including exchange students and students from Beijing). He has completed over 26 funded research projects, of which 18 have been awarded, all with him as the PI, since he joined the Univ. of Pretoria, with a total funding exceeding R30 million. He has been extremely successful in attracting intergovernmental funds, once from the Swedish/RSA, once from the UK/RSA, thrice from the Sino/RSA and thrice from the Franco/RSA scientific agreements.

He has been invited to offer plenary and keynote speeches at international professional conferences and workshops, and he has been invited to write book chapters and survey papers, and his work on observers has been included in text books. He has been involved with a large number of professional and editorial activities. He is a regular reviewer for almost all journals and conferences in his field, such as the IEEE Conference on Decision and Control, IFAC World Congress, IEEE Transactions on Automatic Control, on Control Systems Technology, *Automatica*, etc. He has chaired numerous technical sessions at conferences and symposiums, been involved as a Technical Committee member for lots of influential academic gatherings. In particular, He was the IPC chair for the first African Control Conference held in 2003, and he was the IPC chair for the flagship symposium series of IFAC, the 7th IFAC Symposium on Nonlinear Control Systems, which was held in Pretoria, 22--24 August 2007. He is one of the key members of the team to bring the IFAC World Congress 2014 to South Africa. He also holds a number of visiting positions, as an invited professor at IRCCYN, Nantes, France, in 2001, 2004 and 2005, as a guest professor at Huazhong Univ. of Science and Technology, China, and as a Cheung Kong chair professor at Wuhan Univ., China. He served as the South African IEEE Control Chapter Chair, am serving for IFAC as the Technical Board member.

1. BIOGRAPHICAL SKETCH

1.1 GENERAL INFORMATION										
Surname	XIA									
First names	XIAOHUA				ID Number					
Citizenship					Title	Prof	Female		Male	X
Place of birth	Wuhan, China				Date of birth		20 January 1963			
Population group	African		Coloured		Indian		White	Other <i>(Please specify)</i>	X: Chinese	
Department	Electrical, Electronic and Computer Engineering				Position		Professor			
Direct Telephone	+27 12 420 2165				Direct Telefax		+ 27 12 362 5000			
E-mail	xxia@up.ac.za									
Date of appointment	12 February 1998				Permanent full-time		X	Temporary full-time		

1.2 ACADEMIC QUALIFICATIONS OBTAINED				
Degree/ Diploma	Field of study	Higher education institution	Year	Distinctions
PhD	Automatic Control Theory and Application	Beijing University of Aeronautics and Astronautics, Beijing, China	1989	
MEng	Power Systems and Automation	Wuhan Institute of Hydraulic and Electrical Engineering, Wuhan, China	1986	
BSc	Applied Mathematics	Wuhan Institute of Hydraulic and Electrical Engineering, Wuhan, China	1983	

1.3 WORK EXPERIENCE TO DATE		
Name of employer	Capacity and/or type of work	Period From (mm//yy to mm//yy)
Wuhan University, China	Cheung Kong visiting professor	2006.3—2009.3
Institut de Recherche en Communications et Cybernétique de Nantes, France	Invited Professor	2001.10 -- 2001.12 2004. 7 – 2004.8 2005.6--2005.7
Department of Electric, Electronic and Computer Engineering, University of Pretoria, Pretoria 0002, South Africa	Professor Associate Professor	2000.1 – present 1998.2.12 – 1999.12
Department of Electrical Engineering, National University of Singapore, Kent Ridge Crescent, Singapore	Post Doctoral Fellow	1996.5 -- 1998.2
Laboratoire d'Automatique, Ecole Centrale de Nantes, Nantes, France	Post Doctoral Fellow	1995.11 -- 1996.
Institut fuer Systemdynamik und Regelungstechnik, Universitaet Stuttgart, Stuttgart, Germany	Alexander von Humboldt Fellow	1994.5 -- 1995.10
7th Research Division, Beijing University of Aeronautics and Astronautics, Beijing, China	Lecturer, Associate Professor	1989.8 -- 1994.4
Department of Basic Studies, Wuhan Inst. of Hydraulic and Electrical Engineering , Wuhan, China	Teaching Assistant	1986.6 -- 1986.8

2. TEACHING ACTIVITIES

2.1 Courses presented		
Course	Level (e.g. second year, Masters)	Self developed (Yes or No)
Electric Circuits (I) EBN 120	1st year, Undergraduate	No
Electric Circuits (II) EBN 210	2 nd year, Undergraduate	No
Control Engineering EBB320	3 rd year, Undergraduate	No
Energy Systems EEM 410	4 th year, Undergraduate	Yes
Control Mathematics EBB780	Graduate	Yes
Multivariable Control Systems EMB 732	Graduate	Yes
Advanced Research Topics in Energy Research ERT 732	Graduate	Yes
Nonlinear Control Systems	Graduate	Yes
Optimal Control	Graduate	Yes
Adaptive Control	Graduate	Yes

2.2 Other education and pedagogic courses presented

Course	Year	Institution
Topics in Advanced Nonlinear Control	2008	Denel

3. TEACHING OUTPUTS

3.1 Educational publications and products

[1] I.K. Craig, X. Xia, and J.W. Venter, Introducing HIV/AIDS education into the electrical engineering curriculum at the University of Pretoria, IEEE Transactions on Education, vol. 47, no. 1, 65-73, February 2004.

[2] BE@UP, HIV/AIDS Educational CD Version 1.0, 2002, advisor.

[3] UNESCO, Engineering, Mathematics, Physics & HIV/AIDS: A Generic Integration Course Module for Universities in Africa, 2008, facilitator.

4. OTHER TEACHING CONTRIBUTIONS

4.1 Membership of national and international bodies

na

4.2 Visits to local and overseas universities as guest professor or lecturer in regard to teaching

UNESCO/AWSE in-country Training Workshops on Mainstreaming of HIV/AIDS for Physical, Biological and Engineering Sciences in Rwanda: 28 - 30 March 2007, Botswana: 17 - 19 April 2007 and Kenya: 08 - 10 May 2007.

4.2.1 Southern Africa Universities on HIV/AIDS AND Curricular Reforms: A Control Engineering Approach to HIV/AIDS;

4.2.2 Integration of HIV/AIDS into: Engineering;

4.2.3 The development of an HIV/AIDS integrated engineering curriculum and educational Compact Disks for HIV/AIDS prevention.

4.3 Participation in national and international teaching associations, bodies, committees

Na

5. POSTGRADUATE SUPERVISION

5.1 Supervision or co-supervision of students who have completed degrees				
Name of student	Degree¹/Title of dissertation/ thesis and date completed	Supervisor	Co-supervisor(s)	Duration of studies (years)
Ji Y. C.	M. Eng/1992	W. B. Gao	X. Xia	3 years
Wang Y. F.	M. Eng/1993	X. Xia		3 years
Wang S. P.	M. Eng/1994	X. Xia		3 years
Wan J. X.	M. Eng/1994	X. Xia		3 years
Chen J. X.	M. Eng/2001	J. Delport	X. Xia	2 years
Song, T.	M. Eng/2003	L. Linde	X. Xia	4 years
Sun, Z. D.	PhD/1997	X. Xia		3 years
R. Pothin	PhD/1999	C. H. Moog	X. Xia	3 years
R. Filter	M. Eng/2004	X. Xia		2 years
M. S. Chou	M. Eng/2005	X. Xia		2 years
M. Jeffrey	PhD/2006	X. Xia	I. K. Craig	4 years
D. A. Ouattara	PhD/2006	C. H. Moog	X. Xia	3 years
X. T. Zhuan	PhD/2007	X. Xia		3 years
E. du Toit	MEng/2008	X. Xia		2 years
X. Y. Liang	PhD/2009	X. Xia	J. F. Zhang	3 years
J. van Staden	MEng/2010	J. F. Zhang	X. Xia	2 years
W. Badenhorst	MEng/2010	X. Xia	J. F. Zhang	4 years

5.2 Current post-graduate students					
Name of student	Degree²enrolled for and date of first registration	Project title	Supervisor	Co-supervisor(s)	Year of registration
R. Naidoo	MEng, 2006	To be decided	X. Xia		
S. Gounden	MEng, 2009	Co-generation	X. Xia		
UE Ekpenyong	MSc, 2009	To be decided	X. Xia		

¹ Indicate whether Honours, Masters research, Masters coursework with dissertation or Doctorate

² Indicate whether Honours, Masters research, Masters coursework with dissertation or Doctorate

MS Essien	MSc, 2009	To be decided	X. Xia		
H. Zhang	MEng, 2009	To be decided	JF Zhang	X. Xia	
JO. Botai	MSc, 2008	To be decided	X. Xia		
E. Malatjie	MEng 2010	To be decided	X. Xia		
M. Mojdehi	PhD 2010	To be decided	X. Xia	JF Zhang	
Y. Li	PhD 2010		X. Xia		
X. Ye	PhD 2010		X. Xia		

6. RESEARCH FUNDING

6.1 Obtaining research funds (Optional)				
Origin of research funds <i>(e.g. contract research, THRIP, international funding organisations, other(s))</i>	Title of research project or programme	Duration	Money allocated (R) (Optional - exact amounts not required)	
NSF China	Algebraic approach to nonlinear systems	1992—1994		
Aviation fund, China	Nonlinear system theory with application to automatic landing	1993—1994		
Contract research	Transmitting power control of DS-CDMA cellular systems	1998—1999		
UP post-doctor programme	Control and observation of nonlinear and distributed parameter systems with application to continuous casting	1999		
French government	Control of nonlinear systems with application to electrical machines	1999—2001		
UP post-doctor programme	Algebraic approach to nonlinear time-delay systems	2000		
NRF	Modelling and control of hybrid systems	2001		
NRF	A control system approach to HIV/AIDS	2002—2003		
RSA/Swedish government	A control-aided parameter estimation of oscillatory systems	2003—2005		
RSA/Chinese government	Audio/Video Signal Processing and Monitoring System	2003—2004		
Thrip	Closed-loop control of trains	2003		
<i>CNRS/NRF AGREEMENT</i>	Modelling, Identification and Control of the Dynamics of the Infection of HIV/AIDS	2006--2007		

Franco/RSA Agreement	Aid for early diagnosis of HIV therapies	2006-2007	
RSA/Chinese government	Modelling and Control of River/ Dam Network Systems	2006-2008	
SANERI EEDSM Hub	National Hub for the Postgraduate Programme in Energy Efficiency and Demand-side Management	2008/9-2012/13	
Incentive NRF	Open research	2010	
NRF Competitive	Control Systems in Energy Efficiency	2010-2012	
RSA/Chinese government	Optimal Scheduling of Pumping Stations under Complex Electricity Tariff	2010-2011	

7. RESEARCH OUTPUTS

7.1 Publications in peer-reviewed or refereed journals

- [J1] X. Xia and W. B. Gao, Nonlinear observer design by observer canonical forms, *International Journal of Control*, 47(1988), 1081--1100.
- [J2] X. Xia and W. B. Gao, On the exponential observers of nonlinear systems, *Systems and Control Letters*, 11(1988), 319--325.
- [J3] X. Xia and W. B. Gao, Minimal order dynamic decoupling of nonlinear systems, *Acta Scientia Sinica*, Series A, 1989(10)-1107-1112.
- [J4] X. Xia and W. B. Gao, Nonlinear observer design by observer error linearization, *SIAM Journal of Control and Optimisation*, 27(1989), 199--216.
- [J5] X. Xia and W. B. Gao, On the open loop decoupling problem of nonlinear control systems, *Journal of Beijing Univ. of Aeronautics and Astronautics*, 1989, no. 4, 109--113.
- [J6] X. Xia and W. B. Gao, On the exponential stabilisation and exponential observer design problem of nonlinear systems, *Acta Mathematica Physica A*, 1990:10(3)-343-349.
- [J7] X. Xia and W. B. Gao, Full linearization of nonlinear systems via dynamic state feedback, *Journal of System Science and Mathematical Science*, 10(1990), 149--158.
- [J8] X. Xia and W. B. Gao, Minimal order dynamic decoupling of nonlinear systems, *Science in China*, 33(1990), 617--624.
- [J9] X. Xia and W. B. Gao, A property of the dynamic extension algorithm, *Control Theory and Applications*, 8(1991), 171--184.
- [J10] W. B. Gao, M. Cheng and X. Xia, Development of nonlinear control systems, *Acta Automatica Sinica*, 17(1991), 513--523.
- [J11] X. Xia and W. B. Gao, Simulation of pole assignment of linear control systems, *International Journal of Modelling and Simulation*, 11(1991), 111--113.
- [J12] X. Xia, Principle and implementation of decoupling for nonlinear systems, *Acta Automatica Sinica*, 18(1992), 266--272.
- [J13] X. Xia, The friend set of controlled invariant distribution and parameterisation of DDP feedback, *Acta Scientia Sinica*, Series A, 23(1993), 130--136.
- [J14] X. Xia, On the parameterisation problem of noninteracting feedback for nonlinear systems, *Acta Automatica Sinica*, 1993:19(6)-706-710.
- [J15] Y. Wang, X. Xia and W. Gao, Parameter variations in nonlinear decoupling *Journal of Beijing University of Aeronautics and Astronautics*, 1993: 19(3), pp. 1-9
- [J16] X. Xia, Examples and counterexamples in nonlinear stable noninteracting control, *Acta Automatica Sinica*, 1994:20(2)-186-190.
- [J17] S. Wang and X. Xia, The minimal decoupling design of linear systems: the general case, *Journal of Beijing University of Aeronautics and Astronautics*, 1994:20(3)-235-

- [J18] X. Xia, Parameterisation of decoupling control laws for affine nonlinear systems, *IEEE Transactions on Automatic Control*, AC-38(1993), 916--928.
- [J19] Z. Sun, X. Xia and W. B. Gao, Multiple (A, B)-invariant subspace and the multi-rate sampling control, *Acta Automatica Sinica*, 21(3): 326-332, 1995.
- [J20] Z. D. Sun, X. Xia and W. B. Gao, A sufficient condition for nonregular feedback linearization of nonlinear systems, *Control Theory and Applications*, 13(1996), 41--46.
- [J21] Z. D. Sun and X. Xia, A theorem about dynamic feedback linearization on \mathbb{R}^4 , *Control Theory and Applications*, 13(1996), 500-504.
- [J22] X. Xia, A parameterisation approach to the disturbance decoupling problem with stability of nonlinear systems, *Automatica*, 32(1996), 607--610.
- [J23] Z. D. Sun and X. Xia, Exact control method for induction motor, *Journal of Beijing University of Aeronautics and Astronautics*, 1997, vol. 23 (6), pp. 740-744.
- [J24] X. Xia and M. Zeitz, On continuous nonlinear observers, *International Journal of Control*, 66 (1997) 943-954.
- [J25] Z. D. Sun and X. Xia, On nonregular feedback linearization, *Automatica*, 33 (1997), 1339-1344.
- [J26] Z. D. Sun and X. Xia, A structural decomposition algorithm and its application to the decoupling problem, *Acta Automatica Sinica*, 23 (5): 710-713, 1997.
- [J27] Z. D. Sun and X. Xia, A sufficient condition for nonlinear Morgan's problem, *Acta Automatica Sinica*, vol. 24, no. 4 (1998), 433--438.
- [J28] X. Xia and C. H. Moog, Disturbance decoupling of nonlinear systems by output feedback, *IEEE Transactions on Automatic Control*, 44(1999), 1425--1429.
- [J29] B. Guo, X. Xia, F. R. Camisani-Calzolari and I. K. Craig, A semi-discrete approach to modeling and control of the continuous casting process, *Steel Research*, 71(2000), 220--227.
- [J30] X. Xia, Global Frequency estimation using adaptive identifiers, *IEEE Transactions on Automatic Control*, vol. AC-47, No. 7, July 2002, pp.1188--1193.
- [J31] X. Xia, Well-posedness of piecewise-linear systems with multiple modes and multiple criteria, *IEEE Transactions on Automatic Control*, vol. AC-47, No. 10, October 2002, pp. 1716--1720.
- [J32] X. Xia, C. H. Moog and R. Pothin, Extended output injection and output feedback i/o linearization, *Electronics Letters*, vol. 38, no. 4, pp. 200--202, 2002.
- [J33] X. Xia, LA. Marquez, P. Zagalak and CH. Moog, Analysis of nonlinear time-delay systems using modules over non-commutative rings, *Automatica*, vol. 38 (2002), pp. 1549--1555.
- [J34] R. Pothin, C. H. Moog and X. Xia, Disturbance decoupling of nonlinear MISO systems by static measurement feedback, *Kybernetika*, vol. 38, No.5 (2002), pp. 601-608.
- [J35] X. Xia, C. H. Moog, Identifiability of nonlinear systems with applications to HIV/AIDS models, *IEEE Transactions on Automatic Control*, vol. 48, no. 2, February, 2003, pp. 330--336.
- [J36] X. Xia, Estimation of HIV/AIDS parameters, *Automatica*, 39(2003), 1983--1988.
- [J37] X. Xia, Zero polyhedral cones, *Applied Mathematics Letters*, vol. 16, 961--966, 2003.
- [J38] M. Jeffrey, X. Xia, I.K. Craig, When to initiate HIV therapy: a control theoretic approach, *IEEE Transactions on Biomedical Engineering*, vol. 50, 1213--1220, 2003.
- [J39] X. Xia, R. Gai and G. Chen, Periodic orbits arising from Delta-modulated feedback control, *Chaos, Solitons & Fractals*, vol.19, 581--595, 2004.
- [J40] I.K. Craig, X. Xia, and J.W. Venter, Introducing HIV/AIDS education into the electrical engineering curriculum at the University of Pretoria, *IEEE Transactions on Education*, vol. 47, no. 1, 65--73, February 2004.
- [J41] X. Xia, A. S. I. Zinober, Periodic Orbits from Delta-Modulation of Stable Linear Systems, *IEEE Transactions on Automatic Control*, vol. 49, no. 8, 1376--1380, August 2004.

- [J42] C. Li and X. Xia, On the bound of the Lyapunov exponents for continuous systems, *Chaos*, vol. 14, no. 3, 557—561, September 2004.
- [J43] T. C. Song, L. P. Linde and X. Xia, A new WCDMA transmit power control technique, *The Transactions of the SA Institute of Electrical Engineering*, vol. 96, no. 1, January 2005, pp. 45—55.
- [J44] I.K. Craig and X. Xia, Can HIV/AIDS be controlled? *IEEE Control Systems Magazine*, vol. 25, no. 2, 80—83, February 2005.
- [J45] C. M. Gray, C. Williamson, H. Bredell, A. Puren, X. Xia, R. Filter, L. Zijenah, H. Cao, L. Morries, E. Vardas, M. Colvin, G. Gray, J. McIntyre, R. Musonda, S. Allen, D. Katzenstein, M. Mbizo, N. Kumwenda, T. Taha, S. A. Karim, J. Flores and H. W. Sheppard, Viral dynamics and CD4+ T cell counts in subtype C human immunodeficiency virus type 1-infected individuals from Southern Africa, *Aids Research and Human Retroviruses*, vol. 21, no. 4, 2005, pp. 285--291.
- [J46] R. A. Filter, X. Xia and C. M. Gray, Dynamic HIV/AIDS parameter estimation with application to a vaccine readiness study in Southern Africa, *IEEE Transactions on Biomedical Engineering*, vol. 52, no. 5, May 2005, pp. 284--291.
- [J47] A. M. Jeffrey, X. Xia and I. K. Craig, A viral load time response analysis to anti-retroviral therapy, *The Transactions of the SA Institute of Electrical Engineering*, vol. 96, no. 3, September 2005, pp. 234—239.
- [J48] X. Xia, G. Chen and R. Gai, Control Lyapunov Modes of Linear Control Systems, *The Transactions of the SA Institute of Electrical Engineering*, vol. 96, no. 4, December 2005, pp. 273—278.
- [J49] J. Zhang, X. Xia, and C. H. Moog, Parameter identifiability of nonlinear systems with time-delay, *IEEE Transactions on Automatic Control*, vol. 51, no. 2, 371—375, February 2006.
- [J50] X. Xia and A. S. I. Zinober, Δ -modulated feedback in discretization of sliding mode control, *Automatica*, vol. 42 771- 776, 2006.
- [J51] X. Zhuan and X. Xia, Cruise control scheduling of heavy haul trains, *IEEE Transactions on Control Systems Technology*, Vol. 14, No. 4, 757–766, July 2006.
- [J52] R. Gai, G. Chen and X. Xia, Global dynamics of unbalanced Delta-modulated feedback-controlled discrete-time systems, *Dynamics of Continuous, Discrete and Impulsive Systems, Series B*, 13 (2006) 635-679.
- [J53] R. Gai, X. Xia and G. Chen, Complex dynamics of systems under Delta-modulated feedback, *IEEE Transactions on Automatic Control*, vol. 51, no. 12, 1888-1902, December 2006.
- [J54] M. Chou, X. Xia and C. Kayser, Modelling and model validation of heavy-haul trains equipped with electronically controlled pneumatic brake systems, *Control Engineering Practice*, 15 (2007), 501—509.
- [J55] M. Chou and X. Xia, Optimal cruise control of heavy-haul trains equipped with electronically controlled pneumatic brake systems, *Control Engineering Practice*, 15 (2007) 511—519.
- [J56] X. Xia, Modelling of HIV infection: Vaccine readiness, drug effectiveness and therapeutical failures, *Journal of Process Control*, 17 (2007) 253 - 260.
- [J57] X. Xia and G. Chen, On delta-modulated control: A simple system with complex dynamics, *Chaos, Solitons & Fractals*, 33 (2007) 1314-1328.
- [J58] X. Xia, Periodic orbits arising from two-level quantized feedback control, *Chaos, Solitons & Fractals*, 33 (2007) 1339-1347.
- [J59] Frank Doyle, Lois Jovanovic, Dale Seborg, Robert S. Parker, B. Wayne Bequette, Annah M. Jeffrey, Xiaohua Xia, Ian K. Craig, Thomas McAvoy, A tutorial on biomedical process control, *Journal of Process Control* 17 (2007) 571-594. IV. Structured treatment interruptions: A control mathematical approach to protocol design, by Annah M. Jeffrey, Xiaohua Xia, Ian K. Craig.
- [J60] X. Zhuan and X. Xia, Optimal scheduling and control of heavy haul trains equipped with electronically controlled pneumatic braking systems, *IEEE Transactions on Control Systems Technology*, Vol. 15, No. 6, 1159-1166, NOVEMBER 2007.

- [J61] X. Zhuan and X. Xia, Speed regulation with measured output feedback in the control of heavy haul trains, *Automatica* 44 (2008) 242-247.
- [J62] X. Xia and J. Zhang, Geometric characterization on the solvability of regulator equations, *Automatica* 44 (2008) 445-450.
- [J63] X. Xia, G. Chen, R. Gai and AS. Zinober, Periodicity in Delta-modulated feedback control, *J Control Theory Appl* 2008 6 (1) 37-44.
- [J64] S. Bowong and X. Xia, Robust synchronization of a class of nonlinear systems: applications to chaotic coupled electromechanical systems, *Journal of Vibration and Control*, 14(4): 531-551, 2008.
- [J65] X. Liang, J. Zhang and X. Xia, Improving the security of chaotic synchronization with a Delta-modulated cryptographic technique, *IEEE Transactions on Circuits and Systems II*, vol. 55(7), July 2008, 680-684.
- [J66] X. Liang, J. Zhang and X. Xia, Adaptive synchronization for generalized Lorenz systems, *IEEE Transactions on Automatic Control*, Vol. 53, No. 7, August 2008, pp. 1740-1746.
- [J67] Y. Shen and X. Xia, Semi-global finite-time observers for nonlinear systems, *Automatica* 44 (2008) 3152-3156.
- [J68] X. Zhuan, G. Zheng, and X. Xia, A modelling methodology for natural dam-river network systems, *Control Engineering Practice* 17 (2009) 534-540
- [J69] A. Middelberg, J. Zhang and X. Xia, An optimal control model for load shifting – With application in the energy management of a colliery, *Applied Energy*, 86 (2009) 1266-1273.
- [J70] A.M. Elaiw and X. Xia, HIV dynamics: Analysis and robust multirate MPC-based treatment schedules, *J. Math. Anal. Appl.* 359 (2009) 285-301.
- [J71] S. Zhang and X. Xia, Optimal control of operation efficiency of belt conveyor systems, *Applied Energy*, 87 (2010) 1929-1937.
- [J72] X. Xia and A. M. Elaiw, Optimal dynamic economic dispatch of generation: A review, *Electric Power Systems Research* 80 (2010) 975-986.
- [J73] X. Zhuan and X. Xia, Fault-tolerant control of heavy-haul trains, *Vehicle System Dynamics*, Vol. 48, No. 6, June 2010, 705-735.
- [J74] X Xia and J Zhang, Geometric steady states of nonlinear systems, *IEEE Transactions on Automatic Control*, vol. 55, no.6, pp. 1448-1454, 2010.

7.2 Books and/or chapters in books

- [B1] X.Xia and W. B. Gao, *Nonlinear Systems Control and Decoupling*, Science Press, Beijing, 1993.
- [B2] R. Pothin, C. H. Moog and X. Xia, Stabilization of a series DC motor by dynamic output feedback, in: *NONLINEAR CONTROL IN THE YEAR 2000, VOL 2, LECTURE NOTES IN CONTROL AND INFORMATION SCIENCES 259: 257-263 2001*, A. Isidori, F. Lamnabhi-Lagarrigue and W. Respondek (Eds), Springer, London.
- [B3] AM. Jeffrey and X. Xia, Identifiability of HIV/AIDS models, in: *DETERMINISTIC AND STOCHASTIC MODELS OF AIDS AND HIV WITH INTERVENTION*, Chapter 11, H. Wu and W. Y. Tan (Eds), World Scientific Publications, Singapore 2005.

7.3 Published full-length conference papers/keynote addresses

- [C1] X. Xia and W. B. Gao, Simulation of pole assignment of linear control systems, *IASTED International Conference on Applied Simulation and Modelling*, Santa Barbara, California, USA, 1989.

- [C2] X. Xia, Essential structure of nonlinear systems, *11th IFAC World Congress*, Tallinn, USSR, Aug. 1990.
- [C3] X. Xia and W. B. Gao, Minimal order dynamic I/O linearization and dynamic extension algorithm, *Proceedings of Pre-MTNS*, Hangzhou, China, June 1991.
- [C4] Y. F. Wang, X. Xia and W. B. Gao, Parameter variations in nonlinear noninteracting control, *American Control Conference*, 1994.
- [C5] S. P. Wang, X. Xia and W. B. Gao, An algebraic approach to analysis of nonlinear decoupling, *IFAC Nonlinear Control Systems Design Symposium (NOLCOS'95)*, Tahoe City, California, June, 1995.
- [C6] Z. D. Sun and X. Xia, Some results on singular feedback linearization, *IFAC Conference on System Structure and Control*, Nantes, France, July, 1995.
- [C7] X. Xia, A parameterisation approach to DDPS of nonlinear systems, *3rd European Control Conference*, Rome, Italy, September 1995.
- [C8] M. Zeitz and X. Xia, Nichtlineare stetige Beobachter, *Workshop 1995 GMA-Ausschuss 1.4 "Neuere theoretische Verfahren der Regelungstechnik"*, Interlaken/Switzerland, Sept. 1995.
- [C9] X. Xia and M. Zeitz, On nonlinear continuous observers, *Control'96*, Exeters, England, Sept. 1996, Conference Publication No. 427, 825-830.
- [C10] X. Xia and C. H. Moog, Input output linearization of nonlinear systems by output feedback, *IEEE Conference on Decision and Control*, Kobe, Japan, Dec., 1996.
- [C11] C. H. Moog and X. Xia, Preliminary results on disturbance decoupling by output feedback for nonlinear systems, *4th European Control Conference*, 1997, Brussels.
- [C12] C. H. Moog and X. Xia, Output feedback design for nonlinear systems, *IFAC Workshop on NTDCS*, September 1997.
- [C13] X. Xia, T. H. Lee and S. S. Ge, Nonlinear and fault-tolerant control of separately excited DC motors, *IEEE Conf. SISCTA'97*, Singapore.
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- [C54] Y. Shen and X. Xia, Global finite-time stabilization for a class of nonlinear systems, 7th World Congress on Intelligent Control and Automation, June 25-27, 2008, Chongqing, China.
- [C55] RSM. Thomas, X. Xia and JF. Zhang, Energy efficient geyser, International Conference on Domestic Use of Energy, 18-19 March 2008, Cape Town, South Africa.
- [C56] Jiangfeng Zhang, Xiaohua Xia, and Deepa Alexander, Demand side optimal strategy for voluntary load shedding, IASTED conference on Power and Energy Systems (AfricaPES 2008), 8-10 September 2008, Gaborone, Botswana.
- [C57] X. Liang, J Zhang and X Xia, A chaos-based CDMA scheme with a chaos-based encryption algorithm, *the Second IFAC Conference on Analysis and Control of Chaotic Systems*, London, UK, 22-24 June, 2009.
- [C58] X Xia, J Zhang, A Elaiw, A Model Predictive Control Approach to Dynamic Economic Dispatch Problem, *IEEE Bucharest PowerTech Conference 2009*, Bucharest, Romania, 28 June- 2 July 2009.
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- [C60] W Badenhorst, J Zhang, X Xia, A near optimal hoist scheduling for deep level mine rock winders, *IFAC Symposium on Power Plants and Power Systems Control*, Tampere, Finland, 5-8 July 2009.
- [C61] H Zhang, X Xia, J Zhang, A Residential Energy and Power Conservation System Utilizing an Optimization Model, *IEEE AFRICON*, Nairobi, Kenya, 23-25 September 2009.
- [C62] A Bijker, X Xia, J Zhang, Active power residential non-intrusive appliance load monitoring system, *IEEE AFRICON*, Nairobi, Kenya, 23-25 September 2009.
- [C63] X Xia and J Zhang, Energy Efficiency and Control Systems—from a POET perspective, IFAC Conference on Control Methodologies and Technology for Energy Efficiency, Portugal, 29-31 March 2010.
- [C64] W Badenhorst, J Zhang, X Xia, An MPC approach to deep level mine rock winder hoist control, IFAC Conference on Control Methodologies and Technology for Energy Efficiency, Portugal, 29-31 March 2010.
- [C65] X Xia and J Zhang, Energy Auditing—from a POET perspective, International Conference on Applied Energy, Singapore, 21-23 April 2010.
- [C66] S Zhang and X Xia, Modelling and energy efficiency optimisation of belt conveyors, International Conference on Applied Energy, Singapore, 21-23 April 2010.

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7.4 Non-refereed publications or popular articles <i>na</i>

7.5 Patents <i>na</i>

7.6 Technical reports <i>na</i>

8. OTHER SCHOLARLY RESEARCH-BASED CONTRIBUTIONS

8.1 Participation in conferences, workshops and short courses - specify type of contribution <i>Provide full details of participation in national and international conferences etc</i>

8.1.1 National <i>na</i>

8.1.2 International <ul style="list-style-type: none">• IPC Chair<ul style="list-style-type: none">▪ The 7th IFAC Symposium on Nonlinear Control Systems (NOLCOS 2007), 22-24 August 2007. http://www.nolcos2007.org.za• IPC vice Chair, 1st Africa Control Conference, 3—5 December, 2003, Cape Town, South Africa• IPC vice Chair, 8th IFAC Symposium on Nonlinear Control Systems (Nolcos), Bologna, September 1-3, 2010.• IPC Member<ul style="list-style-type: none">• IFAC Youth World Congress 1995, Beijing, China• The 4th IFAC Symposium on Nonlinear Control System, 1998, Twente, the Netherlands http://lcewww.et.tudelft.nl/~scherpen/nolcos.html• The 2002 International Conference on Control and Automation, 16—19 June 2002, Xiamen, China http://hdd.ece.nus.edu.sg/~icca/• The 4th Asian Control Conference, September 25 -27, 2002, Singapore http://ascc2002.nus.edu.sg• The 4th International Conference on Control and Automation, June 10-12, 2003, Montreal, Canada.• The 6th IFAC Symposium on Nonlinear Control Systems (NOLCOS 2004), September 1-3, 2004, Stuttgart, Germany• 2004 International Conference on Dynamics, Instrumentation and Control,

18—20 August 2004, Nanjing, China, <http://www.me.concordia.ca/~cdic04>

- 5th International Conference on Control and Automation (ICCA'05), Budapest, Hungary, 30 May – 2 June 2005.
- 2nd African Control Conference, Durban, South Africa, 5—7 July 2006.
- 6th International Conference on Control and Automation (ICCA'07), Guangzhou, China, May 30-June 1, 2007.
- 2nd IFAC Conference on Analysis and Control of Chaotic Systems Chaos09, Queen Mary, University of London (www.qmul.ac.uk), 22nd-24th June 2009.
- IFAC Control Systems Design 2009, September 13-16, 2009, Bratislava, Slovak Republic
- IPC Regional Chairs of Asian Control Conference 2009 (ASCC09), Hong Kong from 27-29 August 2009
- IFAC Conference on Control Methodologies and Technology for Energy Efficiency, CMTEE 2010, Vilamoura, Portugal, March 29-31, 2010.

- **Organising Chair/Members**

- Co-Chair of the 3rd IEEE International Conference on Control Theory and Applications, 12-14 December 2001, Pretoria, South Africa. <http://vlab.ee.nus.edu.sg/~iccta>
- Member of Organising Committee, IEEE International Symposium on Industrial Electronics, 1998, Pretoria, South Africa
- Member of Organising Committee, Africon'99, Cape Town, South Africa
- Member of Organising Committee, IFAC Conference on Technology Transfer in Developing Countries: Automation in Infrastructure Creation, Pretoria, South Africa
- Publicity Chair (Africa), first IEEE International Multi-Conference on Systems and Control (MSC) , Singapore, 1-3 October 2007

- **Session (co-) Chair**

- 11th IFAC World Congress, 1990, Tallinn, (former) USSR
- European Control Conference, 1995, Rome, Italy
- IEEE International Symposium on Industrial Electronics, 1998, Pretoria, South Africa
- IEEE Conference on Decision and Control, 1999, Phoenix, USA
- IFAC Symposium on System Structure and Control, 29—31 August 2001, Prague, Czech Republic.
- 2nd Workshop on Chaos Control and Synchronization, 6—8 November 2003, Shanghai, China.
- 1st African Control Conference, 3—5 December 2003, Cape Town, South Africa.
- 6th IFAC Symposium on Nonlinear Control Systems, 1—3 December 2004, Stuttgart, Germany.
- 16th IFAC World Congress, 4—8 July 2005, Prague, Czech Republic.
- IEEE Africon 2007, 26—28 September 2007, Windhoek, Namibia.
- 17th IFAC World Congress, Seoul, Korea, 6-11 July 2008.
- IEEE Africon 2009, Nairobi, Kenya, 23-25 September 2009.

8.2 Teamwork and collaboration with others:

- IK Craig, colleague in the department, collaborating on industrial control projects, co-

supervise PhD student.

- C. Gray, National Institute of Communal Disease, collaborating on HIV/AIDS project
- CH. Moog, my French collaborator on nonlinear control and the joint French project
- A. Medvedev, my Swedish partner on the joint RSA-Swedish project
- S. Zhu, my Chinese partner on the joint RSA-China project
- SPOORNET: Thrip project on closed-loop control of trains
- Knorr-Bremse: Thrip project on closed-loop control of trains
- G. L. Zheng, my Chinese partner at Wuhan University on the joint RSA-China project on the modeling and control of river/dam network.

8.3 Membership in national and international bodies

- Member of CSIAM, since 1990
- Fellow IEEE, since 2010.
- Fellow, SAAE, since 2005.

- Chairman of IEEE South Africa Control Chapter, 2000-2005.
- Associate Editor, AUTOMATICA, November 2000-December 2009.
- Associate Editor, IEEE Transactions on Circuits and Systems II, January 2004-December 2005.
- Associate Editor, IEEE Transactions on Automatic Control, January 2011.
- Chair of IFAC Technical Committee on Nonlinear Control since July 2008, Vice-Chair since 2002;
- Member of Technical Board of IFAC since July 2008;

8.4 Visits to local and overseas universities or research institutes as guest professor or researcher

- Institute of System Science, Academy of China, 1988, 1990, 1992, 2002;
- Shanghai Normal University, Shanghai, China, 1990;
- Chengdu University of Technology, Chengdu, China, 1990;
- Institut fuer Sytemdynamik und Regelungstechnik, Universitaet Stuttgart, Germany, 1994; 2001.
- Laboratoire d'Automatique de Nantes, Ecole Centrale de Nantes, Nantes, France, 1995; 2001
- Centre for Intelligence Control, National University of Singapore, Singapore, 1996;
- Automatic Control Laboratory, Swiss Federal Institute of Technology (ETH), Zurich, Switzerland, August, October 2001
- Seventh Research Division, Beijing University of Aeronautics and Astronautics, Beijing, China, October 2002
- Department of Electrical and Electronics Engineering, Liaoning Technological University, Liaoning, China, October 2002.
- Department of Applied Mathematics, University of Sheffield, UK, March – May 2003.
- Chinese University of Hong Kong, September 2003.
- Department of Automatic Control, Wuhan University, Wuhan, China, October 2003, June 2006.

- Centre of Chaos and Synchronisation, City University of Hong Kong, June—December 2003.
- Department of Automatic Control, Huazhong University of Science and Technology, Wuhan, China, January 2004.

9. ARTISTIC OUTPUTS (*if applicable*)

na

10. MANAGEMENT AND ADMINISTRATIVE DUTIES

- Director, Centre of New Energy Systems, since 2006
- Director, National Hub for Postgraduate Programme in Energy Efficiency and Demand-side Management, since 2008
- Department postgraduate committee
 - Member
 - Function head 2002
- Acting group head from July –December 2000
 - Undergraduate course matters
 - Postgraduate course matters
 - Final year projects (meetings, external examiner)
 - Postgraduate project enquiries
- Department research committee
 - since September 1998
 - Participate the research committee meetings
 - Organising internal and external examinations for Ms and PhD students
- Post-doctoral programme management
 - Opening of the position advertised internationally
 - Post-doctoral fellows Dr. B. Z. Guo, L. Marquez, C. P. Li and S. Bowong
 - Research fellow, J. F. Zhang.
 - Arrangement of accommodation and other administrative matters
 - Organisation of a visit to De Beers
- SACAC
 - Participate SACAC activities such as the General Annual Meeting
 - Organising lobby functions at the 14th IFAC World Congress in Beijing, 15th IFAC World Congress in Barcelona, 16th IFAC World Congress in Prague
 - Bidding committee of the 2014 IFAC World Congress to be held in Cape Town
- Chinese visitors
 - Official reception and presentation (by the Dean) in 2000
 - Two Chinese professors doing sabbatical in the department since March 2002.
- French visitor
 - Technical arrangements: meetings and discussions with staff in the department
 - Social activities include visit of the University, the department, as well as the city of Pretoria
 - Visit to the French Embassy
 - Report to NRF

11. COMMUNITY SERVICE OR PROFESSIONAL SKILLS

11.1 Outreach projects

Public speech given at the AIDS Forum organized by the Centre of Study of Aids, University of Pretoria, on 19 April 2002.

11.2 Professional service performed

na

11.3 Clinical service

na

11.4 Involvement with other universities/scientific institutions

- External examiner, for final year projects, Department of Electrical Engineering, University of Cape Town, 2000, 2002, 2003, 2006, 2007, 2008.
- External examiner, for Master's and PhD student, Department of Electrical Engineering, University of Cape Town, 2005.
- External examiner, PhD, Cape Peninsula University of Technology, 2009
- External examiner, Msci, University of Johannesburg, 2010
- External examiner, MEng, Northwest University, South Africa, 2010.

11.5 Referee duties

numerous

12. AWARDS AND SCIENTIFIC/SCHOLARLY RECOGNITION

12.1 Evaluation status as scientist/scholar

NRF rating A, 2010

12.2 Research awards and prizes

1991.9: (Medal and Certificate): Award of the most distinguished Ph.D by the Ministry of Aviation of China
1991.9: Special Governmental subsidy by the State Council of China
1992.5: (Certificate): 1st class Distinguished Young Researcher award from Fok Ying Tung Education Foundation

1992.12: (Certificate): The best paper award in Acta Automatica Sinica 1992 through the paper: X. Xia, *Principle and implementation of decoupling for nonlinear systems*, *Acta Automatica Sinica*, 18(1992), 266--272.

1993: Elected as a Talent in the Trans-Century Talents Programme by the Chinese Ministry of Education.

2003.3: The Ernest Oppenheimer Memorial Trust Sabbatical Award

2004.3: Exceptional Academic Achiever Award, University of Pretoria.

2007.3: Exceptional Academic Achiever Award, University of Pretoria.

2010.3: Exceptional Academic Achiever Award, University of Pretoria.

12.3 Teaching awards and prizes

na

12.4 Artistic awards and prizes

na