## Research Summary

### IV. Research, Scholarship, and Creative Documentation

(>Last updated 09/12/2007<)

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Please note:

1. I have separated the publications that appeared since I have joined USU from those appeared before I joined USU.
2. * means corresponding author.
3. + means student co-author
4. Some selected papers are listed in the **Index Appendix** section.

### A. Books

After joining USU


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1. "58+36 94" means 58 journal papers published after joining USU, 36 journal papers published before joining USU, total 94 journal papers published.
Before joining USU


B1. Refereed Journal Articles

- * corresponding author.
- + student co-author.

After joining USU in 2000 (60)
Before joining USU in 2000 (34: 9 in English, 25 in Chinese)


**2008 (9)**


**2007 (12):**


2006 (8):

2005 (8):
36. Joshua Hacker4, James Hansen5, Judith Berner5, YangQuan Chen6, Gidon Eshel7, Gregory Hakim8, Steven Lazarus9, Sharanya Majumdar9, Rebecca Morsa10, Andrew Poje10, Vitalii Sheremet11, Youmin Tang12.

2004 (9):

2003 (5):

2002 (5):


2001 (2):


2000 (2):


1999 (2):


1998 (4):


1997 (4):


1996 (0):

1995 (2):


1994 (2):


1993 (5):

1992 (2):

1991 (4):

1990 (7):

1989 (2):
B2. Refereed Conference Papers

* - corresponding author
+: student coauthor

- Refereed Conference Papers (169); After joining USU (140).
- Abstract Based Refereed Conference Papers (12); After joining USU (12).
- Total conference papers after joining USU in 2000: 152.
- Total conference papers: 181.

2007 (16):


12. Qianru Li+ and Christophe Tricaud+ and YangQuan Chen*. “Great Salt Lake Level Forecasting Using FIGARCH Model” DETC2007-34909 in Proc. of the ASME Design Engineering Technical Conferences, Sept. 4-7, 2007 Las Vegas, NE, USA, 3rd ASME Symposium on Fractional Derivatives and Their Applications
2006 (33):


16. Qianru Li+, Christopher Fawson, Christophe Tricaud+ and YangQuan Chen. “Estimating the Conditional Density of Returns Based on Neural Network”. The 6th International Conference on Computational Intelligence in Economics and Finance, July 15-22, 2007, Marriott Salt Lake City Center, Salt Lake City, Utah, USA, a part of the 10th Joint Conferences on Information Sciences (JCIS 2007).

2006 (33):


35. Zhen Song+ and YangQuan Chen*. “High Order B-Spline Networks and Its Applications to Learning Feedforward Control”. June 25-28, 2006, Luoyang, China, IEEE Int. Conf. on Mechatronics and Automation (ICMA06).

2005 (29):
50. Hyosung Ahn+; Kevin L. Moore; YangQuan Chen*. "Stability analysis of iterative learning control system with interval uncertainty". In Proceedings of the 16th IFAC World Congress, Prague, Czech, July 4 to July 8, 2005.
53. Jinsong Liang+, Weiei Zhang and YangQuan Chen*. "Robustness of Boundary Control of Damped Wave Equations with Large Delays at Boundary Measurement". In Proceedings of the 16th IFAC World Congress, Prague, Czech, July 4 to July 8, 2005.


2004 (20):


82. YangQuan Chen*, Kevin L. Moore, Blas M. Vinagre and Igor Podlubny. "Robust PID Controller Autotuning With A Phase Shaper". The First IFAC Symposium on Fractional Differentiation and its Applications 20 04 Bordeaux, France, July 19-20, 2004. (IFAC FDA04)


86. Kevin L. Moore and YangQuan Chen. "MODEL-BASED APPROACH TO CHARACTERIZATION OF DIFFUSION PROCESSES VIA DISTRIBUTED CONTROL OF ACTUATED SENSOR NETWORK". The 1st IFAC Symposium on Telematics Applications in Automation and Robotics. Helsinki University of Technology Espoo, Finland, 21-23 June 2004. (PDF)


90. Zhongmin Wang, YangQuan Chen*, Ning Fang. "Minimum-Time Swing-up of A Rotary Inverted Pendulum by Iterative Impulsive Control". Accepted as a regular contributed interactive paper to present at ACC04. (Jan. 2004) (PDF)

91. Ivo Petr\'a\v{s}, YangQuan Chen*, Blas M. Vinagre and Igor Podlubny. "Stability of Linear Time Invariant Systems with Interval Fractional Orders and Interval Coefficients". International Conference on Computation Cybernetics (ICCC04), 8/30-9/1/2004. Viena Technical University, Viena, Austria. (PDF)


94. Hyo-Sung Ahn and YangQuan Chen*. "Time Periodical Adaptive Friction Compensation". IEEE Int. Conf. on Robotics and Biomimetics (RoboBio04), August 22-25, Shenyang, China. (PDF-robobio2004-100)

95. YangQuan Chen*, Dingyu Xue, and Huifang Dou. "Fractional Calculus and Biomimetic Control". IEEE Int. Conf. on Robotics and Biomimetics (RoboBio04), August 22-25, Shenyang, China. (PDF-robobio2004-347)

96. Jinsong Liang and YangQuan Chen*. "Boundary Control of Wave Equations with Delayed Boundary Measurement". IEEE Int. Conf. on Robotics and Biomimetics (RoboBio04), August 22-25, Shenyang, China. (PDF-robobio2004-348)


2003 (16):


2002 (14):


2001 (5):


130. YangQuan Chen and Kevin L. Moore. ”On DS\{\alpha\}S-type Iterative Learning Control”. Presented at the IEEE Conference on Decision and Control (CDC'01), Dec. 3-7, 2001, Orlando, FL, USA. pp.4451-4456.


2000 (7):


140. Jian Xin Xu, Tong Heng Lee, YangQuan Chen and Hou Tan, ”Enhancing Trajectory Tracking for a Class of Process Control Problems using Iterative Learning”, Proc. of the Asian Control Conference 2000, July 5-7, 2000, Shanghai, China.

1999 (1):


1998 (4):


1997 (11):


1996 (8):


1995 (1):


1994 (1):

1993 (1):

1992 (1):


Refereed (abstract based) Conference Papers (12)


173. YangQuan Chen*, Huifang Dou, Dong Chen, and Anhong Zhou. "Time-frequency approach (TFA) for fast robust DNA sequence comparison" Poster presented by Prof. Anhong Zhou. (PPT, DOC) Tenth Annual Meeting of the Institute of Biological Engineering, March 4-6, 2005, The University of Georgia, Athens, Georgia, Biology-Inspired Engineering Frontiers


C1. Refereed Book Chapters

Refereed Book Chapters and Book Chapter Papers: (17)


C2. Book Reviews

After joining USU (8)


Before joining USU (1)


D. Multi-Media Materials

3. YangQuan Chen. Independent Study Course CD for ECE7930 “Computational Intelligence” Fall 2002.

E. Non-Refereed Articles and National Conference Papers

After joining USU (0)
Before joining USU


2. Tong Heng Lee, Huifang Dou, Kok Kiong Tan, and YangQuan Chen. "Experimental Studies on High Precision Tracking Control of Linear Motor Using Noncausal Filtering Based Iterative Learning Control", distributed at the Asian Control Conference 2000, July 5-7, 2000, Shanghai, China. Late paper.

3. Jian Xin Xu, Tong Heng Lee, YangQuan Chen and Hou Tan, "Enhancing Trajectory Tracking for a Class of Process Control Problems using Iterative Learning", paper prepared for the Asian Control Conference 2000, July 5-7, 2000, Shanghai, China.


F. Scholarly Presentations (Invited Talks, Demos not including formal conference presentations)

Only invited presentations. For conference presentations, see the conference paper list in Section B2.

After joining USU (27)

2007: (1)


2006: (7)


2005: (5)
- 2/25/05. ECE IAC meeting, presentation of "CSOIS: Past, Present, and Future cum MAS-net". Lab tour/Demo.

2004: (5)

- 08/17/2004. “Mobile actuator and sensor networks for diffusion boundary determination and zone control”, Invited talk (75 minutes) at the Institute of Intelligent Machines of Chinese Academy of Sciences (IIM of CAS) in Hefei, the capital city of Anhui Province, China.
- 08/19/2004. “Iterative Learning Control from Academia to Industry”. Invited Seminar (75 minutes) at the Department of Automatic Control, Southwest University, Nanjing, the capital city of Jiangsu Province, China.
- 08/20/2004. “Fractional order control” (75 minutes) Invited Seminar at Institute of Robotics and Artificial Intelligence, Northeastern University, Shenyang, capital city of Liaoning Province, China.

2003: (7)

- 03/05/2003. USU ECE6800 Seminar by Dr YangQuan Chen on FOC. Fractional order calculus, fractional order filter and fractional order control: an over view and some recent developments. Check here for PDF slides.
- 03/28/2003. Une proposition pour la synthèse de correcteurs PI d'ordre non entier. YangQuan Chen (Utah State University, USA), Concepción A. Monje, Blas M. Vinagre (Universidad de Extremadura, Espagne). (Slides PDF) Action thématique "Les systèmes à dérivées non entières" - LAP - ENSEIRB, Bordeaux.
- Invited Tutorial Lecture: 06/13/2003. Parsimonious ILC and RC: Seagate Experience (Tutorial Lecture) at the first Iterative Learning Control International Summer School at Utah State University (See other presentations and photos here)
- Invited Presentation: 06/17/2003. Some Servo Patents for Low Cost High TPI Hard Disk Drives abstract/bio. The Colorado Center for Information Storage, the University of Colorado, Boulder
- 10/17/2003. Réalisation analogique de l'opérateur de dérivation non entière. C. Tricaud (ENSEIRB – Université Bordeaux 1) and YangQuan Chen (Utah State University, USA). (Slides PDF) Action thématique "Les systèmes à dérivées non entières" - LAP - ENSEIRB, Bordeaux.

2002: (0)

2001: (10)

- 02/06/2001. ECE6800 Graduate Seminar. "Fractional order calculus, fractional order filter, and fractional order control: an overview". (zipped PDF slides)
- 10/03/2001. Les dérivées non entières en automatique et traitement des signaux : certains défis. (Slides) B. M. Vinagre (Univ. de Extremadura, Espagne), V. Feliu (Univ. de Castilla-La Mancha, Espagne), I. Petras (Technical Univ. of Kosice, Slovak Republic), I. Podlubny (Technical Univ. of Kosice, Slovak Republic), Y. Chen (Utha State Univ, USA). Action thématique "Les systèmes à dérivées non entières " Jourées des 03 et 04 Octobre 2001 - LAP - ENSEIRB, Bordeaux, France.
- 06/14/2001. "Iterative Learning Control - from academia to industry". Dept. of Electrical and Computer Engineering, University of Windsor, Ontario, Canada. (PPT)
Before joining USU (4)

2000:


1999:


G. Creative Accomplishments (US Patents: 13)

2001:

2002:

2003:

2004:

2005:

2006:
13. US06,831,804. 12/14/2004 “Method and apparatus for handling resonance effects in disc drives using active damping”

2006:
14. 20060265085 Tuning methods for fractional-order controllers (November 23, 2006)

H. External Funding
See the separate pages for proposal efforts.

All Grants
($425K+$437K=$862K external PI, $330K external co-PI, $354K internal PI. Total: $1.54M).
- NSF Junior Faculty Travel Grant for NSF Career Workshop at Tempe, Arizona. March 2003. $700.
- Travel grant from NCAR (National Center for Atmospheric Research), Junior Faculty Forum. June 2003, Boulder, CO. http://www.asp.ucar.edu/eczsa/announce.html $2,000.
- PI. NRC Twinning Grant $16,000. (2003-2005)
- PI. USU NFRG $10,100. (2003-2004)
- PI. SDL Skunkworks Research Initiative Fund. $15,000. (2003-2004)
- PI. Private grant, $3,000. (2003-2004)
- co-PI. NSF NUE (Nano Undergraduate Education) Grant, $100,000. (2004-2006)
- co-PI. National Science Foundation Workshop grant $16K (2004-2005). US - French Workshop on Fractional Derivatives and Their Applications (Award No.: 0425093)
- PI: CURI $20,000. (2005-2006)
- PI. SDL Skunkworks Research Initiative Fund. $17,000. (2005-2006)
- PI. SDL Skunkworks Research Initiative Fund. $17,000. (2005-2006)
- PI: NSF FREE grant. $29K (2006-2007)
- PI: NSF SBIR grant subcontract from Wavelength Electronics; $15K (2006)
- Co-PI. NIH R15 grant $245K (2006-2009)
- PI: UWRL seed grant $32.7K (2006-2007)
- PI: UWRL UAV project $127K (2006-2007)
- PI: DOI Water 2025 project $60K (2006-2008) (with UWRL matching)

I. Awards and Honors for Research
- 2007: Outstanding Researcher of the Year. Dept. of Electrical and Computer Engineering, Utah State University.
- July 19, 2006. IFAC Int. Workshop on Fractional Derivative and its Applications (FDA06), Achievement Award. (awardees picture, from left to right: Alain Oustaloup (France); Stefan Samko (Portugal); Blas M. Vinagre (Spain); Virginia Kiryakova (Bulgaria); Igor Podlubny (Slovak Republic); Francesco Mainardi (Italy); Katsuyuki Nishimoto (Japan); YangQuan Chen (USA); D. Baleanu (Turkey) (FDA08, Turkey, Organization Committee Chair); and J. A. Tenreiro Machado (FDA06, Portugal, Organization Committee Chair))
- Feb. 11, 2005. UC Berkeley Campus. 1st Crossbow Smart Dust Contest, 2nd place. $2000 cash award and $500 travel allowance.

J1. Other: Workshops and Short Courses
2. 06/13/2003. “Parsimonious ILC and RC: Seagate Experience” (Tutorial Lecture) at the first Iterative Learning Control International Summer School at Utah State University (See other presentations and photos here) (half day)
5. FOC Day @ USU, April 19, 2005. “Fractional Order Calculus Day at Utah State University”. Full day workshop. http://mechatronics.ece.usu.edu/foc/event/FOC_Day@USU/

J2. Other: Technical Reports

After joining USU

2. cs.CV/0307051 [abs, ps, pdf, other] An Analytical Piecewise Radial Distortion Model for Precision Camera Calibration
3. cs.CV/0307047 [abs, ps, pdf, other] Rational Radial Distortion Models with Analytical Undistortion Formulae
8. More at http://mechatronics.ece.usu.edu/reports/

Before joining USU (61)

1. On a possible new scheme for PES linearization. 03/99 (6 pages)
2. *Linear Cubic PES Linearisation Scheme - Supporting Proof. 04/99 (1 page)
3. Case Studies - Comparison between Proximate Time Optimal Control (PTOS) and Variable Structure Control (VSC) for Hard Disk Drives (HDD). 04/99 (43 pages)
5. Enhancing Track-Following Performance During Self Servo Writing Via Track-to-Track Iterative Learning Control (T2T-ILC). 04/99 (11 pages)
7. SP-ZAP Implementation Results - Stage-1. 29-04-99. (6 pages)
8. SP-ZAP Implementation Results - Stage-2 (Robustifying ZAP Learning Process Via Scheduled Parameters (SP)). 14-05-99. (4 pages)
10. Enhanced Adaptive Feedforward Control (EAFC) to Cancel Once-Around Disturbance by Shaping the Internal Model. 08/99. (14 pages)
15. RVSC Performance Characterization Using Inject Sine Disturbance via the VCM DAC. 09-23-1999. (9 pages)
17. Results for Combined Compensators of PRLC (Parsimonious Repetitive Learning Compensator) and RVSC (Rotational Vibration/Shock Compensator). 10/99. (6 pages)
19. *SP-ZAP against PES impulses. 27/10/99. (3 pages)
20. An Investigation of Track-squeeze Induced by SP-ZAP (SP-ZAP: Scheduled-Parameters Zero Acceleration Path Algorithm). 15/11/99. (40 pages)
21. Track-squeeze Induced by SP-ZAP: Further Drive-Level Results. 30/11/99. (18 pages)
22. 1F-Component Removal From RROZAP Table Using Optimal Zero-Phase Band-Stop Filtering. 24/11/99. (3 pages)
23. Should We Remove 0F-Component From RROZAP Table? A Study on the de-mean ZAP table effect. 9/12/99. (4 pages)
24. Memo on the Finalized Scheme for SP-ZAP. 13/12/99. (4 pages)
25. U8/PES - drive data display/analysis. 15/04/99. (5 pages)
26. U8 NRRO Spectrums Comparison for BW 600 Hz and BW 800 Hz. 19/11/99. (4 pages)
27. SP-ZAP Memo: Consistency of the learned RROZAP tables at the same track for different runs and the repeatability of the learned RROZAP tables at consecutive tracks. 22/12/99. (9 pages)
28. Should We Learn RROZAP Table Always From Zero? 30/12/99. (3 pages)
29. Design for U6: 1F-Component Removal From RROZAP Table Using Optimal Zero-Phase Band-Stop Filtering. 11/01/2000. (6 pages)
30. Drive Level Shock Disturbance Simulator - An Extension to Lv3Cmd"P". 20/01/2000. (3 pages)
31. Drive Level Compensation of Bad Track-Splice Effects Using SP-ZAP. 30 March 2000. (8 pages)
32. A Cost-effective SP-ZAP Scheme With Neighboring-Track Assistance. 28 Jan 2000, Revised 31 Jan 2000. (6 pages)
33. OT issue due to 1x AFC under strong RV : duplication and fixe. 14 March 2000. (2 pages)
36. Feedforward Scheme to Cancel 930Hz PES Oscillation during Seek Settling Due to Arm or Coil Bending Mode. 22 Feb. 2000. REPORT ref# 2000/273. (with M. Z. Ding and L. L. Tan) (11 pages)
38. Drive Level Results for the Proposed and Implemented "Local Smooth Jerk (LSJ) Seek". REPORT ref# 2000/275. (with M. Z. Ding and K. K. Ooi) (9 pages)
39. Techniques for Improving Seek-settling by Selective Multiple Active Damping Schemes Against Plural Resonance Frequencies. May 19, 2000. (with M. Z. Ding and K. K. Ooi) (10 pages)
42. Tuning knobs of RVSC (rotational vibration/shock compensator) and how to tune them - U6 as an example. Aug. 3, 2000. (4 pages)
43. A brief guide on how to apply mini-shaker to perform RV tests. Aug. 3,2000. (4 pages)
44. After SP-ZAP Learning or During SP-ZAP Learning? A Study on the Time-Domain 1F-Component Removal From RROZAP Table. Nov. 24, 1999. (2 pages)
45. "Method to Improve the Compensation for Written-in Error in A Hard Disk Drive", June 6, 2000. (7 pages) (with Liu X., Lim C.K., Ooi K.K. and Bi, Q)
46. "PES Frequency and Magnitude Dependent Scheduling of Q-filter's Relative Degree in RVSC (Rotational Vibration and Shock Compensator)". Aug. 4, 2000. (9 pages) (with KK Ooi, MZ Ding, LL Tan, SQ Min)
47. "Identification and Cancellation of Cage Frequency in a Hard Disc Drive", July 05, 2000. (14 pages) (with KK Ooi, X. Liu, WW Yeo, WS Lee and BW Quak)
J3. Other: Submitted Manuscripts under Review

- Refereed Journal
  - Some
- Refereed Conferences
  - Some
- Abstract-Based Conferences
  - Several

J4. Other: Completed Graduate Theses

(11: 2 Ph.D. dissertations, 7 MS Plan-A theses, 2 MS Plan-B reports)


J5. Other: Statement of Research Interests

My research interests are in the areas of control systems, signal processing, and industrial automation. I am particularly interested in developing advanced control techniques and applications in the areas of industrial and process control, intelligent control, motion control, robotics and automation, and manufacturing systems engineering.

I can perform research and development at both the system level and subsystems level. At a subsystem level, I am interested in developing adaptive algorithms, nonlinear control schemes, robust control techniques, ideas from iterative learning control theory, and intelligent control schemes. Meanwhile, I am enthusiastic in applying the theoretically developed control algorithms to specific systems such as industrial process control systems, disk drive servo control and fault analysis, aerospace control systems, and mobile robots, and other mechatronic systems such as the precision stage in semiconductor manufacturing process. Most recently my research has focused on the control of
autonomous ground vehicles. More specifically, my research is on the sensing and perception for mobile robot such as wireless visual servoing, information fusion of 2D laser scanner and camera for dynamic environment perception etc.

At the system level, I believe that there are more challenges than in the sub-system level. It is my perception that significant contributions can be made to the theory of analysis, planning, and operation of complex technological and socio-economic systems when these problems are viewed from the perspective of systems theory. Recently, I am more interested in the study of discrete-event dynamic systems theory, hierarchical and supervisory control structures for high-level control and coordination in complex systems, theoretical frameworks for the analysis and support of decision-making in man-machine and autonomous systems, and research in systems analysis and planning, with applications to large-scale systems (e.g., water resource modeling and planning, satellite constellation, the power system, factory automation and process control systems, intelligent vehicle-highway systems, command and control systems, etc.). My recent research in these areas includes high level planning and control of a team of ground vehicles for security surveillance.

As an inventor and co-inventor for 14 US Patents (one has been granted and the others are pending), I am sensitive to any technological innovation possibility yet not restrained myself into all the technical details. I have a clear sense of big picture on (i) whether my academic research work is at a level of possible international journal contribution, (ii) whether the proposed research is feasible based on my knowledge background and accessible resources.

Meanwhile, I am prepared to diversify my future research interests to meet the challenges of the new emerging theory and technologies with an aim for attracting external R&D funds.