



ICPMMT 2018 Keynote Speech

Magnetic Recording Technologies for Position Sensing and Control in Precision Machine

PROFESSOR JEN-YUAN (JAMES) CHANG

BACKGROUND



Prof. Chang is a Professor in the Department of Power Mechanical Engineering of National Tsing Hua University, Taiwan. He received B.S. from National Central University, Taiwan in 1994, M.S. and Ph.D. from Carnegie Mellon University, USA in 1998, and 2001, respectively. Recipient of ASME ISPS Outstanding Contribution Award, Prof. Chang is internationally recognized for his seminal contributions to R&D and leadership in information storage and processing systems, mechatronics, robotics and vibration control, for his R&D career with IBM/Hitachi in Silicon Valley, USA on enterprise high precision, high capacity magnetic disk storage devices. His contributions in the professional fields led to recognitions including Visiting Scholarship/Professorship by NRC-USAF, ASEE and overseas institutions. Prof. Chang has been Associate Editor and Technical Editor of two leading journals and has provided outstanding professional service, including Chair of ASME ISPS Division and Vice Chair of ASME Strategic Committee. He is a Fellow of ASME and Senior Member of IEEE.

QUALIFICATIONS

- Ph.D. Mechanical Engineering (Carnegie Mellon University, USA – 2001)
- M.S. Mechanical Engineering (Carnegie Mellon University, USA – 1998)
- B.S. Mechanical Engineering (National Central University, Taiwan –1994)

RELEVANT EMPLOYMENT HISTORY

2016-Present	Associated Editor, ASME Journal of Vibration and Acoustics
2014-Present	Technical Editor, IEEE/ASME Transactions on Mechatronics
2014-Present	Technical Advisor/Distinguished Research Fellow, MMSL, ITRI, Taiwan
2013-Present	Professor, PME, National Tsing Hua University, Taiwan
2011-2013	Associate Professor, PME, National Tsing Hua University, Taiwan
2008-2011	Sr. Lecturer, SEAT, Massey University, New Zealand
2007-2008	Assistant Professor, Washington State University, USA
2001-2006	Various R&D position in IBM/Hitachi GST, San Jose, California, USA

RESEARCH INTERESTS

Prof. Chang has authored over 150 original papers, 30 patents/applications. His research interests are in the areas of magnetic data storage, mechanics, design, and mechanical vibrations, dynamics, control, robotics and mechatronics emphasizing on dynamics and control of continuous systems and precision intelligent machines. His research and development works combine physical modeling, analysis, numerical simulation, and experimental measurement in understanding basic dynamic phenomena in engineered systems such as rotationally periodic structures, high-speed rotator system, flexible electro-mechanical media, autonomous vehicle/robotics in manufacturing, services, biomedical applications and disk/tape drive mechatronics. Theoretical topics of his current and past researches include magnetism, modal analysis, solid mechanics, elastic stability, gyroscopic systems, finite element analysis, perturbation technique, vibration-membrane stress coupling, control theories, thermal management, dynamic, mechatronic integration and designs.



AWARD

2017	NTHU Industry-University Collaboration Achievement Award
2015	Taiwan Ministry of Science and Technology Outstanding Industry-Academia R&D Achievement Award
2013	IIP Lifetime Achievement Academic Award
2013	STAM Distinguished Young Scholar
2012	Fellow of American Society of Mechanical Engineers
2011	ASME-ISPS Outstanding Contribution Award
2008	US AFRL Faculty Research Fellow

MAJOR RESEARCH PAPERS (JOURNAL PAPERS IN THESE 5 YEARS):

1. B. Chen and **J.Y. Chang**, "Dynamic Analysis of Intelligent Coil Leveling Machine for Cyber-Physical Systems Implementation," *Elsevier Procedia CIRP*, Vol. 63, pp. 390-395, 2017. (EI)
2. C.-J. Hsiao, H.-S. Hsiao, C.-Y. Tseng, J.Y. Chang, C.-K. Sung, S.-C. Wang and T.-S. Chin, "Enhancement in (002) texture of electroplated Co-based hard magnet layers," *AIP Advances*, Vol. 7, 056210, January 2017. (SCI)
3. H.-S. Hsiao, S.-W. Shih, and **J.Y. Chang**, "Dynamic analysis method of a rotating shaft with magnet pattern," *AIP Advances*, Vol. 7, 056620, January 2017. (SCI)
4. Y.-C. Liu, H.-S. Hsiao and **J.Y. Chang**, "Design and validation of polarity-changeable magnetizer for encoding patterns on ring-like rotary encoders," *IEEE Transactions on Magnetics*, Vol. 53, No. 3, 3101105, March 2017. (SCI)
5. H.-S. Hsiao and **J.Y. Chang**, "Characterization of signal integrity due to pitch-roll-yaw rotation tolerance in magnetic position sensing systems," *IEEE Transactions on Magnetics*, Vol. 53, No. 3, 3100907, March 2017. (SCI)
6. Y.-C. Fan, T.-H. Chiang, and J.Y. Chang, "Software Platform Design Technology for IEC 61499," Special Edition on Industry 4.0 Technology, *Journal of the Mechatronic Industry*, Vol. 401, pp. 45-64, August, 2016.
7. C.-Y. Lin, H.-S. Hsiao, and **J.Y. Chang**, "Novel method for determining absolute position information from magnetic patterns," *IEEE Transactions on Magnetics*, Vol. 52, No. 7, Article# 3100904, 2016. (SCI)
8. L. Chen, G. Chen and J. Chang, "An insight to high humidity-caused friction modulation of brake by numerical modeling of dynamic meniscus under shearing," *Lubricants*, Vol. 3(2), pp. 437-446, 2015.
9. H.-S. Hsiao, Z.-H. Xu, T.-S. Chin, C.-K. Sung, S.C. Wang, and **J.Y. Chang**, "Development of a permanent magnet as magnetizer for linear magnetic pattern manufacturing," *IEEE Transactions on Magnetics*, Vol. 50, No. 11, article# 3101804, 2014. (SCI)
10. G. S. Chen, J. Xu, and **J.Y. Chang**, "An insight into nonlinear touchdown dynamics of TFC active slider," *Microsystem Technologies – Micro-and Nanosystems-Information Storage and Processing Systems*, Vol. 20, No. 8-9, pp. 1761-1766, 2014. (SCI)
11. G.S. Chen and **J.Y. Chang**, "Chaos in nonlinear dynamics of air bearing slider in contact," *Microsystem Technologies – Micro-and Nanosystems-Information Storage and Processing Systems*, Vol. 20, No. 8-9, pp. 1739-1744, 2014. (SCI)
12. G. Chen, L. Huang, L.B. Chen, and J.-Y. Chang, "Intelligent diagnosis of bolting systems under uncertain/dynamic impact," *Microsystem Technologies – Micro-and Nanosystems-Information Storage and Processing Systems*, Vol. 20, No. 8-9, pp. 1733-1737, 2014. (SCI)
13. A. Avila and **J.Y. Chang**, "EMG onset detection and upper limb movements identification algorithm," *Microsystem Technologies – Micro-and Nanosystems-Information Storage and Processing Systems*, Vol. 20, No. 8-9, pp. 1635-1640, 2014. (SCI)
14. Z.-H. Xu, S.-C. Wang, T.-S. Chin, J.Y. Chang, and C.-K. Sung, "Multi-pole fine magnetic scale for high-resolution magnetic encoders evidenced by a simplified method," *Microsystem Technologies – Micro-and Nanosystems-Information Storage and Processing Systems*, Vol. 20, No. 8-9, pp. 1491-1496, 2014. (SCI)
15. C.-C. Chen and **J.Y. Chang**, "Alternation of flex cable vibration modes in high precision hard disk drives," *IEEE Transactions on Magnetics*, Vol. 50, No. 3, article# 3100305, 2014. (SCI)
16. C.-C. Chen and **J.Y. Chang**, "Vision-assisted vibration analysis of inhomogeneous flexible cables in hard disk drives," *IEEE Transactions on Magnetics*, Vol. 49, No. 6, pp 2628 – 2633, 2013. (SCI)
17. L. Huang, G. Sheng and J.Y. Chang, "Adaptive flying height modulation control of hybrid active slider with thermal and piezoelectric actuators," *Microsystem Technologies – Micro-and Nanosystems-Information Storage and Processing Systems*, Vol. 19, No. 9-10, pp.1365-1368, 2013. (SCI)
18. G. Sheng, L. Huang and J.Y. Chang, "Feedforward stability control of active slider in sub-nanometer spacing regime,"



- Microsystem Technologies – Micro-and Nanosystems-Information Storage and Processing Systems*, Vol. No. 9-10, pp. 1351-1355, 2013. (SCI)
19. K.-M. Tsai and **J.Y. Chang**, "Attenuation of rotating disk vibrations with sector-shaped plates in data storage devices," *Microsystem Technologies – Micro-and Nanosystems-Information Storage and Processing Systems*, Vol. No. 9-10, pp. 1691-1696, 2013. (SCI)
 20. C.-C. Chen and **J.Y. Chang**, "Vision-assisted profile inspection system of inhomogeneous flex circuits in hard disk drives," *Microsystem Technologies – Micro-and Nanosystems-Information Storage and Processing Systems*, Vol. 19, No. 9-10, pp. 1645-1652, 2013. (SCI)
 21. H.-Y. Cheng and **J.Y. Chang**, "A novel universal joint with PZT-driven cyclic symmetric stator," *Microsystem Technologies – Micro-and Nanosystems-Information Storage and Processing Systems*, Vol. 19, No. 9-10, pp. 1573-1580, 2013. (SCI)
 22. G. Sheng, L. Huang, J. Xu and J.Y. Chang, "Probing and diagnosis of slider-disk interactions in nanometer clearance regime using artificial neural network," *Microsystem Technologies – Micro-and Nanosystems-Information Storage and Processing Systems*, Vol. 18, No.9-10, pp 1255-1259, 2012. (SCI)
 23. M. Mehrtash, M.B. Khamesee, N. Tsuda and J.Y. Chang, "Motion control of a magnetically levitated microrobot using magnetic flux measurement," *Microsystem Technologies – Micro-and Nanosystems-Information Storage and Processing Systems*, accepted, Vol. 18, No.9-10, pp 1417-1424, 2012. (SCI)
 24. M. Mehrtash, M.B. Khamesee, S. Tarao, N. Tsuda and J.Y. Chang, "Human-assisted virtual reality for a magnetic-haptic micromanipulation platform," *Microsystem Technologies – Micro-and Nanosystems-Information Storage and Processing Systems*, Vol. 18, No.9-10, pp 1407-1415, 2012. (SCI)
 25. J.H. Lee, G. Sheng and **J.Y. Chang**, "Micro-tribological interface model for friction induced cold start-up running dynamics," *Microsystem Technologies – Micro-and Nanosystems-Information Storage and Processing Systems*, Vol. 18, No.9-10, pp 1469-1479, 2012. (SCI)
 26. **J.Y. Chang** and D. Wu, "Depletion and harvesting thermal energy from actuator arm electronics in hard disk drives," *Microsystem Technologies – Micro-and Nanosystems-Information Storage and Processing Systems*, Vol. 18, No.9-10, pp 1401-1406, 2012. (SCI)
 27. **J.Y. Chang** and R.N. Mubarak, "Non-operational shock analysis and design of head gimbal assembly in magnetic disk storage devices," *Microsystem Technologies – Micro-and Nanosystems-Information Storage and Processing Systems*, Vol. 18, No.9-10, pp 1463-1468, 2012. (SCI)
 28. **J.Y. Chang**, "Mechanics of flexible interconnect in lateral tape open drives," *Microsystem Technologies – Micro-and Nanosystems-Information Storage and Processing Systems*, accepted, Vol. 18, No.9-10, pp 1513-1516, 2012. (SCI)