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EDUCATION

Ph.D.	Carnegie-Mellon University, Pittsburgh,	1985
M.S.	Carnegie-Mellon University, Pittsburgh,	1982
B. S.	National Tsing-Hua University, Taiwan,	1978

EMPLOYMENT EXPERIENCE

The Ohio State University: 10/1/1985 - present

The Ralph W. Kurtz Endowed Chair in Mechanical Engineering, 2006 – present.
Professor of Mechanical Engineering, 10/1/1994 - present; Associate Professor, 10/1/1990-9/30/1994; Assistant Professor, 10/1/1985-9/30/1990.
Professor (Courtesy appointment), Department of Physiology and Cell Biology, 7/1/2008 – present.

National Tsing-Hua University: 9/1/1992 - 7/31/1993

Visiting Research Associate Professor. Conducted research on information automation and computational geometry rendering intelligent 3-dimensional coordinate metrology of geometrically complex engineered objects.

Carnegie-Mellon University: 9/1/1981 - 8/31/1985

Research Associate (2/1/1985 - 8/31/1985). Worked as a post-doctoral researcher in the Robotics Welding Laboratory. Developed mathematical foundations and computational algorithms enabling effective off-line programming and precise process control of welding robots.

Graduate Research Assistant (2/1/1982 - 1/31/1985). Studied dynamics and control of engineered systems and performed research on forced response of frictionally constrained structures. Developed mathematical foundations for contact kinematics with friction, leading to a better understanding of stick-slip-separation transitions in three-dimensional frictional contact. Developed efficient computational methods to predict the nonlinear dynamic response of frictionally constrained structures and to design friction dampers employed to reduce blade vibration in gas turbine engines.

National Tsing-Hua University: 7/1/1980 - 7/31/1981

Research Assistant. Worked on design and implementation of computer control systems for the speed control of electrical motors.

The Army (Taiwan): 7/15/1978 - 5/24/1980

Technical Officer (Second Lieutenant). Duties including maintenance and repair of military vehicles and equipment, training and supervision of technical personnel.

SCHOLARSHIPS

Research: Professor Menq's research has focused on physical understanding of and mathematical modeling of the dynamics of linear / nonlinear mechanical and electromechanical systems and the physical interactions between these systems, such as probes and manipulators, and samples. He has then used mathematical models, sensing techniques, and engineering principles to design and realize novel engineered systems and one-of-a-kind measurement instruments. He has also used modern electronics, i.e., FPGA, to realize real-time computation and state-of-the-art digital control techniques to achieve superior performance. The objective is to render ultra-precise motion control, dynamic force sensing, and interaction force control to enable controlled probing and manipulation of geometrically complex objects at multiple length scales. Specific application areas include precision engineering and manufacturing, metrology and manipulation at micrometer and nanometer scales, real-time motion tracking and visual servo control of microscopic objects, laser trapping and photonic force microscopy, magnetic trapping and 3-dimensional scanning probe microscopy, and imaging and mechanical characterization of live cells. His research has been supported primarily by the National Science Foundation (NSF), National Institutes of Health (NIH), Air Force Research Laboratories, Ohio Board of Regents, and industry. Dr. Menq has published 122 journal papers. His research contributions are briefly summarized below.

1. **Forced response of frictionally constrained structures:** Over the past thirty years, Dr. Menq has been a significant contributor of original ideas in modeling friction contact, leading to better understandings of the kinematics of contact with friction and accurate prediction of the forced response of frictionally constrained structures. A significant portion of this work has important applications to gas turbine engine components and systems. It explores the role of friction constraints in controlling blade vibration. This work was supported by Air Force Research Laboratories and GUIde Consortium between 1991 and 2007. Based on his research results, a computer program (BDAMPER) was developed, dedicated to friction damper design for both military and commercial turbine engines. Since the very first version of BDAMPER was launched in 1995, it has been employed as a research and design tool by researchers from government agencies (e.g., Air Force, Navy, and NASA) and major engine companies (e.g., GE, Pratt & Whitney, Rolls Royce, Honeywell, and Siemens–Westinghouse).
2. **Coordinate metrology and precision engineering:** Dr. Menq pioneered the development of many rigorous mathematical methods for coordinate metrology and spatial analysis. This work was supported by NSF and laid the foundation for solutions to three critical issues in coordinate metrology and precision engineering, namely part localization, feature calculation, and error/uncertainty analysis. In addition to mathematical methods, he and his students developed many innovative computational algorithms that have had important impact on the profession and practice of coordinate metrology. It enabled rapid improvement of the coordinate metrology industry in terms of machine control and data analysis. Building on his research work on metrology, Dr. Menq has also made significant contributions to precision machining. He and his students investigated surface generation processes in ball-end milling. It led to an innovative approach called Control-Surface Strategy, enabling error prediction and compensation for precision machining of sculptured surfaces. It significantly improved the ability to control 3-D surface dimensions in die and mold productions.
3. **Magnetic levitation and motion control:** Dr. Menq was the first to realize 6-axis laser interferometry coupled with a unique feedback control system to demonstrate 6-axis magnetic levitation. This work was supported by NSF through multiple grants between 1997 and 2003. This technological innovation is perceived to be at the forefront of precision engineering, resulting in technically advanced products that deliver superior performance with longer life. It led to the development of ultra-precise motion control stages, yielding unmatched positioning and orientation stability control, at least three orders of magnitude better than that the traditional stages could achieve. These motion control stages are being used for material characterization, surface profiling, and nano-imprinting.
4. **Vision-based motion tracking and visual servo control:** Based on mathematical models derived by Professor Menq for time-varying interference fringes imposed on moving objects

under an interferometer-equipped optical microscope, a novel visual sensing technique, laterally sampled white light interferometry (L-SWLI), was invented and a U.S. patent was awarded. This work has been supported by NSF since 2006. The poses of multiple 3-D objects are determined from a single image frame obtained at a single time instant and used to serve as the feedback signal for visual servo control, eliminating the effects of kinematic error and continuously compensating for time varying uncertainties induced by mechanical forces and/or thermal structural drift, two of the most challenging issues in precision engineering and instrumentation.

5. **Actively controlled photonic force microscopy:** Dr. Menq (as PI of a NSF grant) and his co-workers built a laser trapping system, wherein a micro/nano bead can be stably trapped to serve as a force-sensing probe. Stable optical trapping of 200 nm functionalized beads was achieved. Initial applications to trapping active organelles inside live cells and maneuvering functionalized probes to interact with membrane proteins were successfully demonstrated. Subsequently, he (as PI of a NIH grant) and his collaborator from college of medicine realized an actively controlled probing system, wherein the motion of the probe is actively controlled to enable a) Brownian motion control; b) 3-dimensional steering; and c) dynamic force sensing. This force microscopic system is being used to investigate protein-protein interactions in live cells.
6. **Modeling and control of multi-axis compliant micromanipulators:** Dr. Menq designed and realized an innovative multi-axis probing system and advanced control schemes to enable an atomic force microscope (AFM) to achieve multi-axis scanning of 3-D samples (e.g. live cells). This work has been supported by NSF since 2007. As the sample is scanned, the estimate of local surface orientation is used to change the control variables in real time to simultaneously achieve three objectives: (a) the tip orientation is commanded to point normal to the local surface, (b) the tapping direction is controlled to tap the sample along the surface normal, and (c) the scanning and interaction control directions are aligned along the local surface tangent and normal respectively. This enables automatic scanning of 3-D samples whose pose and nominal geometry are unknown a posteriori. Compared to conventional atomic force microscopes, which are 2-D planar tools, the multi-axis probing system is a 3-D surface tool.
7. **Control of probe-sample interaction enabling mechanical characterization of live cells:** Dr. Menq developed novel estimation and control methods, leading to the development of a new generation dynamic-mode atomic force microscopy capable of scanning very soft samples, such as live cells. This work was supported by NSF. In such a dynamic-mode atomic force microscope, the probe is a specially designed micro-cantilever, equipped with a very sharp tip and a magnetic actuator, and is controlled to tap the cell surface gently. During scanning, the magnetic actuator is employed to control the tip motion at a high speed such that the tip-sample interaction in each tapping cycle can be precisely controlled, whereas the mechanical property of the cellular surface can be determined in real time. In its current implementation, the atomic force microscope can be applied to scan live cells and generate simultaneously two images: (a) topographic image, and (b) stiffness map. Dr. Menq and his colleagues are currently using this innovative instrument to investigate temporal change and spatial variation of the mechanical readouts of live cells during mitosis. It aims to discover mechanical determinants of live cells that are necessary for cancer invasion and progression.

Teaching and Graduate Advising: Dr. Menq teaches undergraduate courses in system dynamics and vibration, feedback control, and mechanical engineering laboratory, and graduate courses in robotics, digital control of dynamic systems, and lumped parameter system analysis. He has maintained a continuously funded research group. Most funds received have been used to provide financial aid for students and researchers working on research projects and to establish state-of-the-art laboratory facilities. Dr. Menq and his students often conduct laboratory demonstrations on magnetic levitation, scanning probe microscopy, laser trapping to department/college visitors, freshman engineering classes, and high school students. His goals of graduate advising are to stimulate intellectual development of students, to help prepare them for future career, and to help them realize their potential. When working with students, he focuses on four principles: (a) help students build strong and solid knowledge bases; (b) keep abreast of

modern developments and state-of-the-art technology; (c) develop both independent and collaborative study and research skills; and (d) foster critical thinking ability and problem solving skills. Since joining the faculty of the Ohio State University, he has advised 33 PhD students, 47 MS students, and 14 postdoctoral researchers to the completion of their theses and assignments. His former doctoral students hold positions in various academic institutions around the world, as well as leadership positions in industry, and six have established successful companies.

Professional Services: Dr. Menq is an active member of various professional societies. He is a Fellow of American Society of Mechanical Engineers (ASME), Association for the Advancement of Science (AAAS), and Society of Manufacturing Engineers (SME). He served on the 2008 National Academies Panel on Manufacturing Engineering, and many review panels for NSF and NIH. He served as an associate editor of ASME Journal of Manufacturing Science and Engineering between 1996 and 1999 and a technical editor of IEEE/ASME Transactions on Mechatronics between 2000 and 2005. After completing a 5-year term serving as a technical editor of IEEE/ASME Transactions on Mechatronics in 2005, he has continued to serve the professional community. He has continued to serve on ASME/MED Quality and Reliability Committee, the advisory board of Computer-Aided Design Conference and Exhibition, and the International Steering Committee of International Conference on Mechatronics Technology. He served as a guest editor for a focused section of the IEEE/ASME Transactions on Mechatronics, dedicated to electromagnetic devices for precision engineering. In the department, he has served as the chair of various committees, including the Graduate Studies Committee, the Promotion and Tenure Committee, and Faculty Search Committee. Over the past 30 years, he has had many researchers coming from North America, from Europe (e.g., Germany, Italy, Switzerland), and from Asia (e.g., Japan, Korea, Taiwan, China) to visit his research laboratory at Scott Lab.

HONORS AND AWARDS

Fellow of Society of Manufacturing Engineers, 2009
Fellow of American Association for the Advancement of Science, 2008
The Ralph W. Kurtz Endowed Chair Professor in Mechanical Engineering, 2006 -present
The Clara M. & Peter L. Scott Faculty Award for Excellence in Engineering Education¹, 2003
Fellow of American Society of Mechanical Engineers, 1998
College of Engineering Research Award, 1989, 1995, 1999, 2003, 2008
NSF Presidential Young Investigator, 1989
Passed the High Examination of the Section of Electrical Engineering of the National Senior Civic Services(Taiwan), 1980

PROFESSIONAL ACTIVITIES

A. Conference and Committees:

Member, International Steering Committee, International Conference on Mechatronics Technology, 2015-present.
Member, Academic Advisory Board, International CAD Conferences and Exhibitions, 2005-2013.
Member, ASME/MED Quality and Reliability Committee, 2002 – 2011.
Member, Organization Committee, Fourth International Symposium on Motion and Vibration Control (MOVIC'99), September 12-15, 1999, Las Vegas, NV.
Chair, Session WP11-1, "Vision", the 1999 IEEE/ASME International Conference on Advanced Intelligent Mechatronics, September 19-23, 1999, Atlanta, GA.

¹ The Clara M. & Peter L. Scott Faculty Award for Excellence in Engineering Education was established in 1996. The faculty gives this award annually to a senior faculty member who has achieved both national and international status as a leading educator and researcher.

Co-Organizer and Co-Chairman, Session FP09 Natural and Forced Vibration of Bladed Disk Assemblies, the 43rd ASME Gas Turbine and Aeroengine Congress, Exposition and Users Symposium, June 1998, Stockholm, Sweden.

Member, Program Committee, 4th International Workshop on Advanced Motion Control, March 18-21, 1996, Mie University, Tsu, Mie, Japan.

Co-Chairman, Session B7, "Scheduling", Japan-USA Symposium on Flexible Automation, Kobe, Japan, July 11-18, 1994.

Chairman, Session PE-6C, "Signal Processing and Sensors for Manufacturing," Symposium on Mechatronics, 1993 ASME Winter Annual Meeting, Nov. 28-Dec. 3, New Orleans, LA.

Chairman, Session E4, "Precision Engineering", Japan-USA Symposium on Flexible Automation, San Francisco, California, July 13-15, 1992.

Member, USA Program Committee, Japan-USA Symposium on Flexible Automation, San Francisco, California, July 13-15, 1992.

Co-Chairman, Session FM9, "Robust Control III", 1992 American Control Conference, Chicago, Illinois, June 24-26, 1992.

Chairman, Session PE-5A, Symposium on Sensors, Controls, and Quality Issues in Manufacturing, ASME 1991 Winter Annual Meeting, Atlanta, GA, December 1-6, 1991.

Co-Organizer, Symposium on Sensors, Controls, and Quality Issues in Manufacturing, ASME 1991 Winter Annual Meeting, Atlanta, GA, December 1-6, 1991.

Co-Chairman, "Concurrent Production and Process Design Practice," session, Symposium on Concurrent Product and Process Design, ASME 1989 Winter Annual Meeting, San Francisco, CA, December 10-15, 1989.

Member, Organizing Committee, NAMRC XVII, Columbus, Ohio, May 24-26, 1989

Chairman, Session 4-c, NAMRC XVII, Columbus, Ohio, May 24-26, 1989

B. Editorial Service:

Associate Editor, ASME Journal of Manufacturing Science and Engineering (12/1/95 – 11/3/99)

Technical Editor, IEEE/ASME Transactions on Mechatronics (1/1/2000 – 12/31/2004)

Guest Editor, for a focused section of the IEEE/ASME Transactions on Mechatronics, dedicated to electromagnetic devices for precision engineering (2010-2011)

C. Reviewer for:

Review panel for National Science Foundation

Review panel for National Institutes of Health

Review approximately 20 journal papers per year for

- ASME Journal of Manufacturing Science and Engineering
- ASME Journal of Dynamic Systems, Measurement, and Control
- ASME Journal of Vibration and Acoustics.
- ASME Journal of Mechanical Design
- ASME Journal of Computing and Information Science in Engineering
- IEEE Transactions on Robotics
- IEEE/ASME Transactions on Mechatronics
- IEEE Transactions on Automation Science and Engineering
- IEEE Transactions on Pattern Analysis and Machine Intelligence
- IEEE Transactions on Nanotechnology
- IEEE Transactions on Control Systems Technology
- Review of Scientific Instruments
- Applied Physics Letters
- Measurement Science and Technology
- Journal of Computer Aided Design
- Journal of Precision Engineering

PATENTS

United States Patent 7705996: Methods and systems for ultra-precise measurement and control of object motion in six degrees of freedom by projection and measurement of interference fringes

Inventors: Jung H. Kim and Chia-Hsiang Menq

Date Issued: April 27, 2010 **Assignee:** Ohio State University (Columbus, OH)

PUBLICATIONS

As of December 1, 2018, I have the following total number of citations and h-indices:

- **Web of Science:** 3069 citations, h-index=34
- **Google Scholar:** 7016 citations, h-index=50, i10-index=107

A. Editorial Work:

“Focused Section on Electromagnetic Devices for Precision Engineering,” *IEEE/ASME Transactions on Mechatronics*, Vol. 16, No. 3, pp. 401-508, June 2011, Guest Editors: Chen, I-M, Benbouzid, M, Ding, H, Kim, W-J, **Menq, C.H.**

“Special Issue on Computing Technologies to Support Geometric Dimensioning & Tolerancing (GD&T),” *ASME Journal of Computing and Information Science in Engineering*, Vol. 3, March 2003, pp. 1-105, Guest Editors: Alain Desrochers, **C.H. Menq**, Bob Wilhelm.

“Sensors, Controls, and Quality Issues in Manufacturing,” *ASME PED*-Vol. 55, Editors: T. I. Liu, **C. H. Menq**, and N. H. Chao, 421 pages, New York, 1991.

B. Archival Journal Articles:

122. Cheng, P. and **Menq, C. H.**, 2018, “Visual Tracking of 6-Axis Motion Rendering Ultra Precise Visual Servoing of Microscopic Objects,” *IEEE/ASME Transactions on Mechatronics*, Vol. 23, No. 4, pp. 1564-1572, August 2018, DOI: 10.1109/TMECH.2018.2842155.
121. Sheng, X., **Menq, C. H.**, and Tao, T., 2018, “Active Damping and Disturbance Rejection Control of a Six-Axis Magnetic Levitation Stage,” *Review of Scientific Instruments*, Vol. 89, 075109 (2018), DOI: 10.1063/1.5010432.
120. Cheng, P., Jhiang, M.S., and **Menq, C.H.**, 2017, “Modeling and calibrating nonlinearity and crosstalk in back focal plane interferometry for three-dimensional position detection,” *Optics Letters*, Vol. 42, No. 19, pp. 3948-3951, October 1 2017, DOI:10.1364/OL.42.003948.
119. Cheng, P., Hollingsworth, B.A., Scarberry, D., Sheng, X., Shen, D.H., Powell, K., Smart, S., Kirschner, L.S., **Menq, C.H.**, and Jhiang, M.S., 2017, “Automated microSPECT/microCT image analysis of the mouse thyroid gland,” *Thyroid*, September 2017, DOI: 10.1089/thy.2017.0264.
118. Cheng, P. and **Menq, C. H.**, 2017, “Ultra Precise 3-Axis Visual Motion Tracking of Microscopic Objects,” *IEEE Transactions on Instrumentation & Measurement*, Vol. 66, No. 10, pp. 2597-2605, October 2017. DOI: 10.1109/TIM.2017.2712939.
117. Long, F., Matsuura, D., and **Menq, C. H.**, 2016, “Actively Controlled Hexapole Electromagnetic Actuating System Enabling 3-D Force Manipulation in Aqueous Solutions,” *IEEE/ASME Transactions on Mechatronics*, Vol. 21, No. 3, pp. 1540-1551, June 2016, DOI: 10.1109/TMECH.2015.2503274.
116. Liu, Z., Jeong, Y., and **Menq, C. H.**, 2016, “Real-time Reconstruction of Multi-mode Tip-Motion of Micro-cantilevers in Dynamic Atomic Force Microscopy,” *IEEE/ASME Transactions on Mechatronics*, Vol. 21, No. 2, pp. 825-837, April 2016, DOI: 10.1109/TMECH.2015.2472557.

115. Wang, Y., Jeong, Y., Jhiang, S.M., Yu, L., and **Menq, C. H.**, 2014, "Quantitative characterization of cell behaviors through cell cycle progression via automated cell tracking," *PLoS ONE* 9(6): e98762. DOI: 10.1371/journal.pone.0098762.
114. Jayanth, GR. and **Menq, C. H.**, 2014, "Design and Modeling of an Active 5-Axis Compliant Micromanipulator," *ASME Journal of Mechanisms and Robotics*, Vol. 6, 041014 (2014) (10 pages), DOI: 10.1115/1.4027947.
113. Cheng, P., Jhiang, S.M., and **Menq, C. H.**, 2013, "Real-time visual sensing system achieving high-speed 3-D particle tracking with nanometer resolution," *Applied Optics*, Vol. 52, No. 31, pp. 7530-7539, 1 November 2013, DOI: 10.1364/AO.52.007530.
112. Liu, Z., Jeong, Y., and **Menq, C. H.**, 2013, "Calibration of measurement sensitivities of multiple micro-cantilever dynamic modes in atomic force microscopy using a contact detection method," *Review of Scientific Instruments*, Vol. 84, 023703 (2013), DOI: 10.1063/1.4790194.
111. Cheng, P. and **Menq, C. H.**, 2013, "Cancelling Bias Induced by Correlation Coefficient Interpolation for Ultra-Precise Sub-pixel Image Registration," *Meas. Sci. Technol.* 24 (2013) 035404 (10pp), DOI: 10.1088/0957-0233/24/3/035404.
110. Cheng, P. and **Menq, C. H.**, 2013, "Real-time Continuous Image Registration Enabling Ultra-precise Two-dimensional Motion Tracking," *IEEE Transactions on Image Processing*, Vol. 22, No. 5, pp. 2081-2090, 2013, DOI: 10.1109/TIP.2013.2244608.
109. Zhang, Z., Long, F., and **Menq, C. H.**, 2013, "Three-Dimensional Visual Servo Control of a Magnetically Propelled Microscopic Bead," *IEEE Transactions on Robotics*, Vol. 29, No. 2, pp. 373-382, April 2013, DOI: 10.1109/TRO.2012.2229671.
108. Jayanth, GR. and **Menq, C. H.**, 2013, "Two-Axis Force Sensing and Control of a Re-orientable Scanning Probe," *IEEE/ASME Transactions on Mechatronics*, Vol. 18, No. 2, pp. 687-696, April 2013, DOI: 10.1109/TMECH.2012.2183145.
107. Jayanth, GR. and **Menq, C. H.**, 2012, "Tip Motion Control and Scanning of a Reorientable Micromanipulator with Axially-located Tip," *IEEE/ASME Transactions on Mechatronics*, Vol. 17, No. 5, pp. 801-810, October 2012, DOI: 10.1109/TMECH.2011.2136382.
106. Huang, Y., Cheng, P. and **Menq, C. H.**, 2011, "Dynamic Force Sensing Using an Optically Trapped Probing System," *IEEE/ASME Transactions on Mechatronics*, Vol. 16, No. 6, pp. 1145-1154, December 2011, DOI: 10.1109/TMECH.2010.2082557.
105. Chen, I-M, Benbouzid, M, Ding, H, Kim, W-J, **Menq, C.H.**, 2011, "Guest Editorial: Introduction to the Focused Section on Electromagnetic Devices for Precision Engineering," *IEEE/ASME Transactions on Mechatronics*, Vol. 16, No. 3, pp. 401-410, June 2011, DOI: 10.1109/TMECH.2011.2131147.
104. Zhang, Z. and **Menq, C. H.**, 2011, "Design and Modeling of a 3D Magnetic Actuator for Magnetic Microbead Manipulation", *IEEE/ASME Transactions on Mechatronics*, Vol. 16, No. 3, pp. 421-430, June 2011, DOI: 10.1109/TMECH.2011.2105500.
103. Zhang, Z., Huang, Y., and **Menq, C. H.**, 2010, "Actively Controlled Manipulation of a Magnetic Microbead using Quadrupole Magnetic Tweezers", *IEEE Transactions on Robotics*, Vol. 26, No. 3, pp. 531-541, June 2010, DOI: 10.1109/TRO.2010.2047526.
102. Zhang, Z., Huang, K., and **Menq, C. H.**, 2010, "Design, Implementation, and Force Modeling of Quadruple Magnetic Tweezer", *IEEE/ASME Transactions on Mechatronics*, Vol. 15, Issue 5, pp. 704-713, October 2010, DOI: 10.1109/TMECH.2009.2032179.
101. Jayanth, GR. and **Menq, C. H.**, 2010, "Control of a Two-Axis Micromanipulator-based Scanning Probe System for 2.5D Nanometrology," *IEEE/ASME Transactions on Mechatronics*, Vol. 15, Issue 5, pp. 661-670, October 2010, DOI: 10.1109/TMECH.2009.2031595.
100. Jeong, Y., Jayanth, GR., Jhiang, S., and **Menq, C. H.**, 2010, "Design and Fabrication of an Active Multi-axis Probing System for High Speed Atomic Force Microscopy," *IEEE Transactions on Nanotechnology*, Vol. 9, No. 3, pp. 392-399, May 2010, DOI: 10.1109/TNANO.2009.2029333.
99. Jayanth, GR. and **Menq, C. H.**, 2010, "Modeling and Design of a Magnetically Actuated Two-Axis Compliant Micromanipulator for Nano-manipulation," *IEEE/ASME Transactions on Mechatronics*, Vol. 15, Issue 3, pp. 360-370, June 2010. DOI: 10.1109/TMECH.2009.2026170.

98. Huang, Y., Zhang, Z. and **Menq, C. H.**, 2009, "Minimum-variance Brownian motion control of an optically trapped probe," *Applied Optics*, **48**, 5871-5880 (2009); also published in the November 10, 2009 issue of Virtual Journal for Biomedical Optics (VJBO).
97. Wan, J., Huang, Y., Jhiang, S. and **Menq, C. H.**, 2009, "Real-time in Situ Calibration of an Optically Trapped Probing system," *Applied Optics*, **48**, 4832-4841 (2009); also published in the October 21, 2009 issue of Virtual Journal for Biomedical Optics (VJBO).
96. Huang, Y., Wan, J., Cheng, M. C., Zhang, Z., Jhiang, S., and **Menq, C. H.**, 2009, "Three-axis rapid steering of optically propelled micro/nano particles," *Review of Scientific Instruments*, Vol. 80, 063107 (2009); also published in the July 1, 2009 issue of Virtual Journal of Biological Physics Research, DOI: 10.1063/1.3156838.
95. Zhang, Z. and **Menq, C. H.**, 2009, "Best linear unbiased axial localization in three-dimensional fluorescent bead tracking with subnanometer resolution using off-focus images," *Journal of the Optical Society of America A*, Vol. 26, No. 6, pp. 1484-1493, June 2009; also published in the July 30, 2009 issue of the Virtual Journal for Biomedical Optics (VJBO).
94. Cigeroglu, E., An, N., and **Menq, C. H.**, 2009, "Forced Response Prediction of Constrained and Unconstrained Structures Coupled through Frictional Contacts," *ASME Journal of Engineering for Gas Turbines and Power*, Vol. 131, 022505, March 2009. (also published online on December 23, 2008), DOI: 10.1115/1.2940356.
93. Kim, J. and **Menq, C. H.**, 2009, "Visual Servo Control Achieving Nanometer Resolution in X-Y-Z," *IEEE Transactions on Robotics*, Vol. 25, No. 1, February 2009, pp. 109-116, DOI: 10.1109/TRO.2008.2003267.
92. Zhang, Z. and **Menq, C. H.**, 2008, "Three-Dimensional particle tracking with subnanometer resolution using off-focus images," *Applied Optics*, Vol. 47, No. 13, pp. 2361-2370, 1 May 2008.
91. Hu, K., Kim, J., Schmiedeler, J., and **Menq, C. H.**, 2008, "Design, Implementation, and Control of a Six-Axis Compliant Stage", *Review of Scientific Instruments*, Vol. 79, 025105 (2008); also published in the March 3, 2008 issue of Virtual Journal of Nanoscale Science & Technology, DOI: 10.1063/1.2841804.
90. Jayanth, GR., Jhiang, S., and **Menq, C. H.**, 2008, "Two-axis probing system for Atomic Force Microscopy", *Review of Scientific Instruments*, Vol. 79, 023705 (2008); also published in the February 25, 2008 issue of Virtual Journal of Nanoscale Science & Technology, DOI: 10.1063/1.2841805.
89. Kim, J. and **Menq, C. H.**, 2008 "Visually Servoed 3D Alignment of Multiple Objects with Sub-Nanometer Precision ", *IEEE Transactions on Nanotechnology*, Vol. 7, No. 3, May 2008, pp. 321-330, DOI: 10.1109/TNANO.2007.914997.
88. Jeong, Y., Jayanth, GR., and **Menq, C. H.**, 2007, "Control of tip-to-sample distance in atomic force microscopy: a dual-actuator tip-motion control scheme," *Review of Scientific Instruments*, Vol. 78, 093706 (2007); also published in the October 8, 2007 issue of Virtual Journal of Nanoscale Science & Technology, DOI: 10.1063/1.2785158.
87. Zhang, Z. and **Menq, C. H.**, 2007, "Design and Development of a Six-axis Interferometric Measurement System", *Review of Scientific Instruments*, Vol. 78, 083107 (2007), DOI: 10.1063/1.2776011.
86. Zhang, Z. and **Menq, C. H.**, 2007, "Six-axis Magnetic Levitation and Motion Control", *IEEE Transactions on Robotics*, Vol. 23, No. 2, April 2007, pp. 196-205, DOI: 10.1109/TRO.2007.892232.
85. Cigeroglu, E., An, N., and **Menq, C. H.**, 2007, "A Microslip Friction Model with Normal Load Variation Induced by Normal Motion," *Nonlinear Dynamics- Special Issue on Discontinuous Dynamical Systems*, Vol. 50 issue 3, pp. 609-626, DOI 10.1007/s11071-006-9171-4.
84. Huang, Y. and **Menq, C. H.**, 2006, "Design and Development of a Large Range Linear Encoder with Subnanometer Resolution," *Review of Scientific Instruments*, Vol. 77, 105104 (2006), DOI: 10.1063/1.2358694.
83. Jeong, Y., Jayanth, GR., Jhiang, S., and **Menq, C. H.**, 2006, "Direct tip-sample interaction force control for the dynamic mode atomic force microscopy", *Applied Physics Letters*, Vol. 88, 204102 (2006), DOI: 10.1063/1.2203958.

82. Jayanth, GR., Jeong, Y., and **Menq, C. H.**, 2006, "Direct tip position control using magnetic actuation for achieving fast scanning in tapping mode atomic force microscopy", *Review of Scientific Instruments*, Vol. 77, 053704 (2006), DOI: 10.1063/1.2200874.
81. Cigeroglu, E., Lu, W., and **Menq, C. H.**, 2006, "One-Dimensional Dynamic Microslip Friction Model," *Journal of Sound and Vibration*, Vol. 292, pp 881-898, DOI: 10.1016/j.jsv.2005.09.019.
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28. Xia, Z. and **Menq, C. H.**, "Modeling and Control of Flexible Manipulators; Part I: Dynamic Analysis and Characterization," Proceedings of the Symposium Dynamic of Flexible Multibody Systems: Theory and Experiment, pp. 105-114, 1992 ASME Winter Annual Meeting, November 8-13, Anaheim, CA.
27. Chen, B. S. and **Menq, C. H.**, "Initial Attempts on the Characterization and Representation of Functional Requirements of Mechanical Products for Concurrent Engineering," Proceedings of the Symposium on Concurrent Engineering, pp. 315-329, 1992 ASME Winter Annual Meeting, November 8-13, Anaheim, CA.
26. Yau, H. T. and **Menq, C. H.**, "A Unified Least Square Approach for the Evaluation of Geometric Tolerances," Proceedings of the Symposium on Quality Assurance through Integration of Manufacturing Processes and Systems, 1992 ASME Winter Annual Meeting, November 8-13, Anaheim, CA.
25. Yang, B. D. and **Menq, C. H.**, "Compensation for Form Error of End-milled Sculptured Surface Using Discrete Measurement Data," Proceedings of the 1992 Japan-USA Symposium on Flexible Automation, pp. 385-392, July 13-15, San Francisco, CA.
24. Xia, Z. and **Menq, C. H.**, "End-Point Tracking Control of A One-link Flexible Manipulator," Proceedings of the 1992 Japan-USA Symposium on Flexible Automation, pp. 715-722, July 13-15, San Francisco, CA.
23. **Menq, C. H.** and Chen, J. J., "Precision Tracking Control of Discrete-time Nonminimum-phase Systems," Proceedings of the 1992 American Control Conference, pp. 1097-1101, June 24-26, 1992, Chicago, IL.
22. **Menq, C. H.** and Hsia, K. C., "Discrete Model Regulation for Systems with Uncertain Dynamics," Proceedings of the 1992 American Control Conference, pp. 3261-3266, June 24-26, 1992, Chicago, IL.
21. Yang, B. D. and **Menq, C. H.**, "Evaluation of Form Tolerances and Compensation for Form Errors Using Discrete Measurement Data," Proceedings of The 1992 NSF Design and Manufacturing Systems Conference, pp. 823-829, January 6-9, 1992, Atlanta, GA.
20. Sarkar, B. and **Menq, C. H.**, "Scanning Compound Surfaces with No Existing CAD Model by Using Touch-triggered Probe of A Coordinate Measuring Machine," Proceedings of the

- Symposium on Intelligent Design and Manufacturing for Prototyping, pp. 97-112, the 1991 ASME Winter Annual Meeting, Dec. 1-6, 1991, Atlanta, GA.
19. Yau, H. T. and **Menq, C. H.**, "Concurrent Process Planning for Machining and Inspection of Sculptured Surfaces," Transactions of the North American Manufacturing Research Institution of SME, NAMRC XIX, pp. 320-326, May 22-24, 1991, University of Missouri-Rolla, Rolla, Missouri.
 18. Yau, H. T. and **Menq, C. H.**, "Path Planning for Automated Dimensional Inspection Using Coordinate Measuring Machines," Proceedings of the 1991 IEEE International Conference on Robotics and Automation, pp. 1934-1939, April 7-12, 1991, Sacramento, CA.
 17. Xia, Z. and **Menq, C. H.**, "Precision Tracking Control of Discrete-time Nonminimum-phase Systems and Its Application to Noncircular Cutting," Proceedings of the Symposium on Automation of Manufacturing Processes, pp. 95-100, the 1990 ASME Winter Annual Meeting, November 25-30, 1990, Dallas, Texas.
 16. **Menq, C. H.** and Xia, Z., "Characterization and Compensation of Discrete-time Nonminimum-phase Zeros for Precision Tracking Control," Proceedings of the Symposium on Robotics Research, DSC-Vol. 26, pp. 15-23, the 1990 ASME Winter Annual Meeting, November 25-30, 1990, Dallas, Texas.
 15. **Menq, C. H.**, Yau, H. T., Lai, G. Y., and Miller, A., "Statistical Evaluation of Form Tolerances Using Discrete Measurement Data," Proceedings of the Symposium on Advances in Integrated Product Design and Manufacturing, pp. 135-150, the 1990 ASME Winter Annual Meeting, November 25-30, 1990, Dallas, Texas.
 14. Yau, H. T. and **Menq, C. H.**, "The Development of An Intelligent Dimensional Inspection Environment in Manufacturing," Proceedings of JAPAN-U.S.A. Symposium on Flexible Automation, pp. 1059-1065, July 9-13, 1990, Kyoto, Japan.
 13. Chen, J. S. and **Menq, C. H.**, "Experiments on The Payload-Adaptation of A Flexible One-link Manipulator," Proceedings of the 1990 IEEE International Conference on Robotics and Automation, pp. 1614-1619, May 13-18, 1990, Cincinnati, OH
 12. **Menq, C. H.**, Wong, C. L., and Yau, H. T., "An Intelligent Planning Environment for Automated Dimensional Inspection of Manufactured Objects," Proceedings of the Symposium on Concurrent Product and Process Design, pp. 121-128, the 1989 ASME Winter Annual Meeting, December 11-15, 1989, San Francisco, CA.
 11. Griffin, J. H. and **Menq, C. H.**, "Friction Damping of Circular Motion," Machinery Dynamics Applications and Vibration Control Problems, Editor: T. S. Sankar, ASME-DE-Vol. 18-2, pp. 187-193, ASME 12th Biennial Conference on Mechanical Vibration and Noise, Montreal, Canada, September 17-20, 1989.
 10. Borm, J. H. and **Menq, C. H.**, "Experimental Study of Observability of Parameter Errors in Robot Calibration," Proceedings of 1989 IEEE International Conference on Robotics and Automation, pp. 587-592, May 16-18, 1989, Scottsdale, Arizona.
 9. Lai, J. Y., **Menq, C. H.**, and Singh, R., "Accurate Position Control of A Pneumatic Actuator," Proceedings of the 1989 American Control Conference, pp. 1497-1502, June 21-23, 1989, Pittsburgh, PA.
 8. Sahoo, K. and **Menq, C. H.**, "Localization of 3-D Objects Using Surface Representation and Tactile Sensing," Proceedings of The Symposium on Computer Aided Design and Manufacture of Dies and Molds, pp. 105-118, 1988 ASME Winter Annual Meeting, November 28 to December 2, Chicago, IL.
 7. Lai, Z. C. and **Menq, C. H.**, "Motion Control of Manipulators with Closed-Form Solutions Near Wrist Singularities," Proceedings of the 1988 International Computers in Engineering Conference, Vol. 2, pp. 283-292, July 31 to August 4, 1988, San Francisco, CA.
 6. **Menq, C. H.**, Borm, J. H., and Lai, Z. C., "Estimation and Observability Measure of Parameter Errors in A Robot Kinematic Model," Proceedings of U.S.A.-JAPAN Symposium on Flexible Automation, Vol. 1, pp. 65-70, July 17-20, 1988, Minneapolis, MN.
 5. **Menq, C. H.** and Chen, J. S., "Dynamic Modeling and Payload-Adaptation of A Flexible Manipulator," Proceedings of the 1988 American Control Conference, Vol. 1, pp. 69-73, June 15-17, 1988, Atlanta, GA.

4. Kielb, R. E., Griffin, J. H., and **Menq, C. H.**, "Evaluation of A Turbine Blade Damper Using An Integrated Approach," Proceedings of AIAA 29th Structures, Structural Dynamics & Material Conference, April 18-20, 1988, Williamsburg, Virginia.
3. Lai, Z. C. and **Menq, C. H.**, "A Solution Algorithm of Inverse Kinematic Problem for Robots with Calibration," Proceedings of Manufacturing International'88, Vol. 3, pp. 41-48, April 17-20, 1988, Atlanta, Georgia.
2. **Menq, C. H.** and Borm, J. H., "Statistical Measure and Characterization of Robot Positioning Errors," Proceedings of 1988 IEEE International Conference on Robotics and Automation, Vol. 2, pp. 926-931, April 26-28, 1988, Philadelphia.
1. **Menq, C. H.** and Chen, J. S., "Dynamic Modeling and Payload-Adaptive Control of A Flexible Manipulator," Proceedings of 1988 IEEE International Conference on Robotics and Automation, Vol. 1, pp. 488-493, April 26-28, 1988, Philadelphia.

SEMINARS AND PRESENTATIONS

86. "Sensing and Control Enabling Three-dimensional Scanning Probe Microscopy," Keynote Speech at The 19th International Conference on Mechatronics Technology, Tokyo Institute of Technology, November 27-30, 2015, Tokyo, Japan.
85. "Vision-based Motion Tracking of Microscopic Objects", Department of Power Mechanical Engineering, National Tsing-Hua University, March 19, 2015, Hsin-Chu, Taiwan.
84. "Three-dimensional nanometrology and nanomanipulation", Department of Mechanical and Aerospace Engineering, University of California, Los Angeles, June 6, 2012, Los Angeles, CA.
83. "Dynamic Force Probing and Mechanical Property Mapping of Living Cells," Institute of Physics, Academia Sinica, March 23, 2010, Taipei, Taiwan.
82. "Force Probing and Mechanical Property Mapping of Live Cells", Department of Mechanical and Nuclear Engineering, The Pennsylvania State University, October 27, 2009, University Park, PA.
81. "Advanced Actuation and Control for High-Speed Atomic Force Microscopy", Department of Mechanical, Materials, and Aerospace Engineering, Illinois Institute of Technology, November 5, 2008, Chicago, Illinois.
80. "Ultra Precision Visual Servo Control," Department of Power Mechanical Engineering, National Tsing-Hua University, May 11, 2007, Hsin-Chu, Taiwan.
79. "Imaging and Manipulation of Biological Systems," Department of Mechanical Engineering, National Cheng-Kong University, May 8, 2007, Tainan, Taiwan.
78. "Precision Measurement and Control for Imaging and Manipulation," Department of Mechanical Science and Engineering, Tokyo Institute of Technology, January 19, 2007, Tokyo, Japan.
77. "Control of Tip Position Using Co-located magnetic actuation for High-speed AFM," Kanazawa Workshop on Atomic Force Microscopy, January 15-18, 2007, Kanazawa New Grand Hotel, Kanazawa, Japan.
76. "Improved Wedge Damper Models," 2006 GUIde Annual Meeting, July 31 to August 1, 2006, Carnegie-Mellon University, Pittsburgh, PA.
75. "Microslip Friction Model with 2D Slip Motion and Time Variant Normal Load" 2005 GUIde Annual Meeting, July 26 to July 27, 2005, Pratt & Whitney, East Hartford, CT.
74. "Time Variant Normal Load Microslip Model," 2004 GUIde Annual Meeting, July 29 to July 30, 2004, Carnegie-Mellon University, Pittsburgh, PA.
73. "Friction Damping and Nonlinear Forced Response of Frictionally Constrained Turbine Blades," Eminent Professor Lecture Series, Siemens Westinghouse Power Corporation, July 8, 2004, Orlando, FL.
72. "Ultra Precision Motion Control and Its Application to Manufacture of Precision Die and Mold," Die & Mold Education Resources Center, Chung-Yuan University, March 11, 2004, Chung-Li, Taiwan.
71. "Ultra Precision Motion Control and Its Applications in Nanotechnology," Precision Die & Mold Research Center, National Chung-Cheng University, March 10, 2004, Chia-Yi, Taiwan.

70. "Modeling Microslip Effects and Wedge Dampers," 2003 GUIde Annual Meeting, July 30 to July 31, 2003, Rolls Royce Training Center, Indianapolis, IN.
69. "Design and Control of A Multi-axis Magnetic Suspension Stage," Department of Mechanical and Eletromechnical Engineering, National Sun-Yate Sen University, September 17, 2002, Kaohsiung, Taiwan.
68. "Development of A Nano Coordinate Measuring System," Department of Mechanical Engineering, National Chung-Cheng University, September 16, 2002, Chia-Yi, Taiwan.
67. "An Ultra Precision Motion Control Stage and Its Applications," Industrial technology Research Institute, September 13, 2002, Shin-Chu, Taiwan.
66. "Modeling Microslip and Its Applications in Friction Damper Design," 2002 GUIde Annual Meeting, July 31 to August 1, 2002, GE's Customer Technical Education Center, Cincinnati, OH.
65. "Development and Control of A Magnetic Suspension Stage and Applications," Department of Mechanical Engineering, National Cheng Kung University, December 18, 2001, Tainan, Taiwan.
64. "Ultra Precision Motion Control of A Magnetic Suspension Stage," Department of Mechanical Engineering, National Taiwan University, December 13, 2001, Taipei, Taiwan.
63. "Effects of Microslip on Vibration Analysis," 2001 GUIde Annual Meeting, August 1-2, 2001, Carnegie-Mellon University, Pittsburgh, PA.
62. "Modeling and Design of 3D Wedge Dampers," 2000 GUIde Annual Meeting, August 8-9, 2000, Duke University, Durham, NC.
61. "Design and Dynamic Analysis of Friction Damping and Shroud Contact," 1999 GUIde Annual Meeting, August 12-13, 1999, University of Michigan, An Arbor, MI.
60. "Rapid Surface Digitization and Agile Metrology of Precision Mechanical Components," Intelligent System Division, National Institute of Standards and Technology, June 15, 1999, Gaithersburg, MD 20899.
59. "Prediction of Periodic Response of Blades Having 3D Nonlinear Shroud Constraints," The 44th ASME Gas Turbine & Aeroengine Technical Congress, Exposition and User Symposium, June 7-10, 1999, Indianapolis, Indiana USA.
58. "Prediction of Resonant Response of Shrouded Blades with 3D Shroud Constraint," The 43rd ASME Gas Turbine & Aeroengine Technical Congress, Exposition and User Symposium, June 2-5, 1998, Stockholm, Sweden.
57. "Prediction of the Resonant Response of frictionally Constrained Blade Systems Using Constrained Mode Shapes," The 43rd ASME Gas Turbine & Aeroengine Technical Congress, Exposition and User Symposium, June 2-5, 1998, Stockholm, Sweden.
56. "Prediction of Periodic Response of Shrouded Blades," 1998 GUIde Annual Meeting, August 12-13, 1998, Columbus, OH.
55. "Prediction of Resonant Response of Blades Having 3D Nonlinear Shroud Constraint Using Multi-Harmonic Balance Method," The 3rd National Turbine Engine High Cycle Fatigue (HCF) Conference, February 2-5, 1998, San Antonio, Texas.
54. "Contact Kinematics of Shroud Interface and Prediction of Resonant Response of Shrouded Blades," 1997 GUIde Annual Meeting, August 20-22, 1997, Dayton, OH.
53. "Characterization of Contact Kinematics and Application to the Design of Wedge Dampers in Turbomachinery Blading, Part I: Stick-slip Contact Kinematics," International Gas Turbine & Aeroengine Congress & Exhibition, June 2-5, 1997, Orlando, FL.
52. "Prediction of Resonant Response of Frictionally Constrained Turbine Blades," The 2nd National Turbine Engine HCF Program Coordination Meeting, December 9-12, 1996, Monterey, CA
51. "3D Coordinate Metrology and Precision Engineering," Department of Mechanical Engineering, Carnegie-Mellon University, November 8, 1996, Pittsburgh, PA.
50. "Flexible Cutting Systems of Ball-end Milling," and "Integrated Planning for Precision Machining of Complex Sculptured Surfaces," October 15, 1996, Xi'an Jeotong University, Xi'an, China.
49. "3D Coordinate Metrology, " and "Coordinate Acquisition and Reverse Engineering," October 13, 1996;

48. "3D Coordinate Metrology and Precision Engineering," Alcoa Technical Center, Aluminum Company of America, September 19, 1996, Alcoa Center, PA.
47. "Contact Kinematics of Friction Interfaces," Wright-Patterson Air Force Base, August 21, 1996, Dayton, OH.
46. "Uncertainty Analysis for Coordinate Estimation Using Discrete Measurement Data," 1995 ASME International Mechanical Engineering Congress and Exposition, November 12-17, 1995, San Francisco, CA.
45. "Precision Machining of Complex Surfaces," ASME International Mechanical Engineering Congress and Exposition November 12-17, 1995, San Francisco, CA.
44. "Application of Computer Vision in Reverse Engineering for 3D Coordinate Acquisition," ASME International Mechanical Engineering Congress and Exposition November 12-17, 1995, San Francisco, CA.
43. "Cutting Path and Feedrate Optimization for Complex Surface Machining Using Ball End Milling Process," the 1995 International Computers in Engineering Conference, September 12-15, 1995, Boston, MA.
42. "Uncertainty Analysis of Coordinate Estimation Using Discrete Measurement Data," the Interface95, June 21-24, 1995, Pittsburgh, PA.
41. "Integrated Planning for Precision Machining of Complex Surfaces," The University of Illinois at Chicago, May 12, 1995, Chicago, IL.
40. "Development of a Finishing Tool for Sculptured Surface Productions," the Third International Conference on Automation Technology, July 6-9, 1994, Taipei, Taiwan.
39. "Prediction and Compensation of Machining Errors for Sculptured Surfaces Produced By Ball-End Milling Process," the 1994 Japan-USA Symposium on Flexible Automation, July 11-18, 1994, Kobe, Japan.
38. "Prediction and Compensation of the Dimensional Errors of Ball-end Milling Processes," University of Akron, April 1, 1994, Akron, OH.
37. "Uncertainty Analysis of Coordinate Estimation and Tolerance Evaluation," Alcoa Technical Center, Aluminum Company of America, March 23, 1994, Alcoa Center, PA.
36. "3D Coordinate Metrology and Dimensional Control of Sculptured Surface Productions Using Ball-end Milling Process," University of Michigan, February 10, 1994, Ann Arbor, MI.
35. "Reverse Engineering in the Design of Engine Intake and Exhaust Ports," 1993 ASME Winter Annual Meeting, Nov. 28-Dec. 3, New Orleans, LA.
34. "Dynamic Analysis and Design of Friction Damping and Shroud Contact," NASA Lewis, August 12, 1993, Cleveland, OH.
33. "Integrated Machining and Dimensional Inspection for Die & Mold Manufacturing," National Cheng-Kung University, March 23, 1993, Tainan, Taiwan.
32. "Automated Dimensional Inspection and Geometric Tolerance Evaluation," National Sun-yet-san University, March 18, 1993, Kao-hsiung, Taiwan.
31. "3-D Coordinate Metrology," Precision Instrument Development Center, National Science Council, March 10, 1993, Hsinchu, Taiwan.
30. "Coordinate Metrology and Robotics Calibration," Institute of Information Science, Academia Sinica, February 25, 1993, Taipei, Taiwan.
29. "Integrated Machining and Dimensional Inspection for Die & Mold Manufacturing," National Tsing-Hua University, October 29, 1992, Taiwan.
28. "Automated Dimensional Inspection and Geometric Tolerance Evaluation," National Central University, October 20, 1992, Taiwan.
27. "Dynamic Analysis and Design of Friction Damping and Shroud Contact," Air Propulsion Laboratory, Wright-Patterson AFB, August 13, 1992, Dayton, OH.
26. "Compensation for Form Error of End-milled Sculptured Surface Using Discrete Measurement Data," 1992 Japan-USA Symposium on Flexible Automation, July 13-15, 1992, San Francisco, CA.
25. "Integrated Machining and Inspection for Die & Mold Manufacturing," 1992 Ohio Symposium on Advances in Science and Technology, April 18, 1992, Columbus, Ohio.
24. "Scanning Compound Surfaces with No Existing CAD Model by Using Touch-triggered Probe of A Coordinate Measuring Machine," Symposium on Intelligent Design and

- Manufacturing for Prototyping, the 1991 ASME Winter Annual Meeting, Dec. 1-6, 1991, Atlanta, GA.
23. "Modeling and Manufacturing of Objects with Multiple Features Based on Measurement Data." and "Automated Dimensional Inspection Using Coordinate Measuring Machines," Institute of Manufacturing Systems Engineering, Beijing University of Aeronautics & Astronautics, July, 1991, Beijing, China.
 22. "Automated Dimensional Inspection Using Coordinate Measuring Machines," and "Statistical Evaluation and Compensation of Form Errors Using Discrete Measurement Data." CIMS Research Center, Xi'an Jiaotong University, July, 1991, Xi'an, China.
 21. "Automated Dimensional Inspection Using Coordinate Measuring Machines," and "Precision Tracking Control of Discrete Time Systems," Department of Mechanical Engineering, Southeast University, July, 1991, Nanjing, China.
 20. "Path Planning for Automated Dimensional Inspection Using Coordinate Measuring Machines," the 1991 IEEE International Conference on Robotics and Automation, April 7-12, 1991, Sacramento, CA.
 19. "Statistical Evaluation of Form Tolerances Using Discrete Measurement Data," Symposium on Advances in Integrated Product Design and Manufacturing, the 1990 ASME Winter Annual Meeting, November 25-30, 1990, Dallas, Texas.
 18. "Characterization and Compensation of Discrete Time Nonminimum Phase Zeros for Precision Tracking Control" Symposium on Robotics: Control Systems, the 1990 ASME Winter Annual Meeting, November 25-30, 1990, Dallas, Texas.
 17. "The Development of An Intelligent Dimensional Inspection Environment in Manufacturing," JAPAN-U.S.A. Symposium on Flexible Automation, July 9-13, 1990, Kyoto, Japan.
 16. "Modeling and Vibration Analysis of Friction Joints," CMU Forced Response Workshop, March 1, 1990, Pittsburgh, PA.
 15. "Computer Integrated Dimensional Inspection," Metal Industries Development Center, December 22, 1989, Kaohsiung, Taiwan.
 14. "Automated Dimensional Inspection in Manufacturing," National Taiwan Institute of Technology, December 18, 1989, Taipei, Taiwan.
 13. "An Intelligent Planning Environment for Automated Dimensional Inspection," Systems Technology Division, IBM, June 8, 1989, Endicott, New York.
 12. "Experimental Study of Observability of Parameter Errors in Robot Calibration," 1989 IEEE International Conference on Robotics and Automation, May 16-18, 1989, Scottsdale, Arizona.
 11. "Localization of 3-D Objects Using Surface Representation and Tactile Sensing," 1988 ASME Winter Annual Meeting, Chicago, Illinois, November 28 to December 2, 1988.
 10. "Estimation and Observability Measure of Parameter Errors in A Robot Kinematic Model," U.S.A.-Japan Symposium on Flexible Automation, Minneapolis, Minnesota, July 17-20, 1988.
 9. "Statistical Measure and Characterization of Robot Positioning Errors," 1988 IEEE International Conference on Robotics and Automation, Philadelphia, Pennsylvania , April 26-28, 1988.
 8. "Dynamic Modeling and Payload-Adaptive Control of A Flexible Manipulator," 1988 IEEE International Conference on Robotics and Automation, Philadelphia, Pennsylvania , April 26-28, 1988.
 7. "The Forced Response of Shrouded Fan Stages," ASME Design Engineering Technical Conference, Cincinnati, Ohio, September 10-13, 1985.
 6. "The Control of Blade Vibration in Gas Turbine Engines," The Ohio State University, Columbus, Ohio, April, 1985.
 5. "The Influence of Variable Normal Load on The Forced Vibration of A Frictionally Damped Structure," The 30th International Gas Turbine Conference, Houston, Texas, March 18-21, 1985.
 4. "The Vibration Control of Turbine Blades Through The Use of Friction Interfaces," Pennsylvania State University, University Park, Pennsylvania, February, 1985.
 3. "An Integrated Model of Shrouded Fan Blade Vibration," University of Illinois, Urbana-Champaign, Illinois, January, 1985.

2. "The Vibratory Response of Frictionally Constrained Gas Turbine Engine Blades," University of Minnesota, Minneapolis, Minnesota, September, 1984.
1. "A New Microslip Model of Friction," Carnegie-Mellon University, Pittsburgh, Pennsylvania, October, 1983.

RESEARCH GRANTS AND CONTRACTS (Total 16M, not including equipment and software donation; 11M with C. H. Menq as P.I. and 5M as Co-P.I.)

45. "Mechanisms Underlying Phenotypic Heterogeneity of Radioiodine Refractory Thyroid Cancer", **Co-PI: C. H. Menq** (PI: Sissy Jhiang), 1R01CA240522, National Cancer Institute, Under Review, \$3,133,025 for 5 years.
44. "Image-Guided Assessment of I-131 Radiosensitivity in Thyroid Cancer", **Co-PI: C. H. Menq** (PI: Sissy Jhiang), 1R21CA223297, National Cancer Institute, Pending, \$429,000 for two years.
43. "Discretionary Research Funds", **PI: C. H. Menq**, Ralph W. Kurtz Chair Endowment, 10/1/2006 to 6/30/2021, \$750,000.
42. "Preserving Salivary Function During Radioiodine Therapy in Thyroid Cancer", **Co-I: C. H. Menq** (PI: Sissy Jhiang), NIH/NCI, P50CA168505, Project 2, \$1,716,000, 08/01/2013-07/31/2019.
41. "Genetic and signaling pathways in epithelial thyroid cancer", **Co-I: C. H. Menq** (PI: Sissy Jhiang), NIH/NCI, P01CA124570, Project 3, \$1,701,385, 04/01/2013-3/31/2019.
40. "Ultra-precise Coordinate Metrology of Three-dimensional Objects at Micrometer and Nanometer Scales", **PI: C. H. Menq**, National Science Foundation, 5/1/2012 to 4/30/2017, \$465,036.
39. "Mechanical signatures permissive for epithelial-to-mesenchymal transition in thyroid cells", **Subproject PI: C. H. Menq**, Development Research Program Award, NIH/NCI P50CA168505-01A1, The Ohio State University and MD Anderson Cancer Center Thyroid Cancer SPORE (PI: M. Ringel), 09/25/2013 to 07/31/2015, \$155,750.
38. "Six-Axis Visual Sensing and Visual Servo Control Rendering Direct Metrology for Manipulation of Multiple Micro Objects", **PI: C. H. Menq**, National Science Foundation, 7/1/2011 to 6/30/2015, \$467,248.
37. "Modeling and Control of Magnetically Actuated Compliant Micromanipulators Enabling Multi-axis Scanning of 3D Micro/Nano Objects", **PI: C. H. Menq**, National Science Foundation, 10/1/2009 to 9/30/2012, \$399,730.
36. "Actively controlled photonic force microscopy", **PI: C. H. Menq**, (Co-Investigator: S. Jhiang), National Institutes of Health, 9/01/2009 to 8/31/2012, \$559,875.
35. "A Coordinate Measuring Machine for Three-Dimensional Micro Devices", **PI: C. H. Menq**, National Science Foundation, 7/1/2007 to 6/30/2010, \$390,567.
34. "Development of A Photonic Force Microscopic System for Visualization and Manipulation of Biological Structures and Systems", **PI: C. H. Menq**, (Co-PIs: S. Jhiang, K. Srinivasan, J. Robinson, R. Burry) National Science Foundation, 10/1/2006 to 9/30/2009, \$704,458 (\$464,458 from NSF, \$120,000 from OBOR and \$120,000 from OSU).
33. "Automated Visual Guidance and Direct Metrology for Precision Manufacturing", **PI: C. H. Menq**, National Science Foundation, 10/1/2006 to 9/30/2009, \$365,983.
32. "Development of an Automated Visually Guided Motion Control System for Multi Scale Imaging and Manipulation of Biological and Engineered Systems", **PI: C. H. Menq**, (Co-PIs: S. Jhiang, K. Srinivasan, J. Robinson, B. Bhushan) National Science Foundation, 9/1/2004 to 8/31/2007, \$600,000 (\$420,000 from NSF, \$90,000 from OBOR and \$90,000 from OSU).
31. "NIRT: Robust Manufacturing Protocol for Particulate-like Nanoporous Micro-devices (NMDs) for Biomedical and Biochemical Applications (Manufacturing Processes at the Nanoscale)," **Co-PI: C. H. Menq** (PI: Ly James Lee & 4 Co-PIs), National Science Foundation, 8/15/2003 to 7/31/2006, \$854,000.
30. "3D Coordinate Metrology," **PI: C. H. Menq**, Integrated Quality Inc., 1/1/2003 to 12/31/2005, \$95,000.
29. "Modeling Microslip Effects in Vibration Analysis," **PI: C. H. Menq**, Air Force Research Laboratories and GUIDe (III) Consortium, 4/1/02 to 2/28/07, \$484,673.

28. "Development of Improved Models and Prediction Methods for Friction Dampers," **PI: C. H. Menq**, GE Aircraft Engines, 11/1/2001 to 12/31/2002, \$107,730.
27. "A NER Proposal: Development of a Nano-lithography Based Manufacturing Protocol for Polymer Nanofluidic Platforms," **Co-PI: C. H. Menq** (PI: Ly James Lee), National Science Foundation, 8/1/2001 to 7/31/2002, \$100,000.
26. "Automatic Data Segmentation and Geometric Reasoning of Unorganized Point Cloud for Reversed Engineering of Precision Mechanical Objects", **PI: C. H. Menq**, National Science Foundation, 7/1/2001 to 6/30/2004, \$289,278.
25. "Information Aggregation of 3D Coordinate Data and Multiple-Sensor Planning for Agile Metrology and Precision Manufacturing", **PI: C. H. Menq**, National Science Foundation, 10/1/2000 to 9/30/2003, \$320,663.
24. "3D Coordinate Metrology," **PI: C. H. Menq**, Integrated Quality Inc., 1/1/2000 to 12/31/2002, \$373,000.
23. "An Ultra Precision Interferometric System for Real-Time Measurement and Control of Six-Degree-Of-Freedom Motion", **PI: C. H. Menq**, National Science Foundation, 10/1/99 to 9/30/2002, \$270,000.
22. "Modeling, Design and Control of Electromagnetic Systems with Permanent-Electro-Magnet Combinations and Its Application to the Development of A High Performance Magnetic Suspension Actuator", **PI: C. H. Menq**, National Science Foundation, 10/1/97 to 9/30/2000, \$150,000.
21. "Multiple Sensor Integration for Rapid Surface Digitization and Agile Metrology of High Precision Engineered Mechanical Components", **PI: C. H. Menq**, National Science Foundation, 10/1/97 to 9/30/2000, \$305,021.
20. "Development of A Large Travel Multiple Degrees of Freedom Magnetic Suspension Actuator", **PI: C. H. Menq**, National Science Foundation, 7/1/97 to 6/30/2000, \$213,481.
19. "3D Coordinate Metrology," **PI: C. H. Menq**, Integrated Quality Inc., 7/1/97 to 12/31/99, \$310,400.
18. "Dynamic Analysis of Shrouded Blades and Design of Shroud Contact," **PI: C. H. Menq**, The Air Force and GUIde (II) Consortium, 11/15/96 to 3/15/01, \$353,098.
17. "3D Coordinate Metrology," **PI: C. H. Menq**, Alcoa Foundation, 7/1/96 to 6/30/97, \$7,500
16. "Integrated Planning for Precision Machining of Complex Surfaces," **PI: C. H. Menq**, National Science Foundation, 7/1/95 to 6/30/98, \$272,175.
15. "Dynamic Analysis of Shrouded Blades and Design of Shroud Contact," **PI: C. H. Menq**, Air Force Research Laboratories, GUIde (I) Consortium, and Naval Air Systems Command, 7/1/96 to 8/31/97, \$85,000.
14. "Measurement of Contact Thermal Conductivity and Electrical Conductivity for Spot Welding," **PI: C. H. Menq**, General Motors, 10/1/95 to 9/30/96, \$40,000.
13. "Laboratory Equipment for Improved Undergraduate Education in Fluid Power Actuation and Control," **Co-PI: C. H. Menq** (PI: K. Srinivasan), National Science Foundation, 8/1/95 to 7/31/97, \$41,940 plus OSU cost-sharing \$41,940.
12. "Characterization of Functional Requirements and Dimensional Tolerances for Concurrent Design and Manufacturing," **PI: C. H. Menq**, National Science Foundation, 1/1/93 to 12/31/95, \$120,000.
11. "Dynamic Analysis and Design of Friction Dampers and Shroud Contact," **PI: C. H. Menq**, Allison Engineering Company and GUIde (I) Consortium, 8/1/91 to 7/31/95, \$242,333.
10. "Concurrent Process Planning for Machining and Inspection," **Subproject PI: C. H. Menq**, National Science Foundation ERC for Net-Shape Manufacturing (Center Director: Taylan Altan), 5/1/91 to 4/30/94, \$188,908.
9. "Dimensional Tolerancing and Inspection," **Subproject PI: C. H. Menq**, National Science Foundation ERC for Net-Shape Manufacturing (Center Director: Taylan Altan), 7/1/90 to 4/30/94, \$196,576.
8. "Presidential Young Investigator," **PI: C. H. Menq**, National Science Foundation , 11/1/89 to 10/31/94, \$312,500.
7. "3D Coordinate Metrology of Precision Mechanical Parts," **PI: C. H. Menq**, National Science Council of Republic of China, 8/1/92 to 7/31/93, NT\$412,500.

6. "Computer Integrated Dimensional Inspection in Manufacturing," **PI: C. H. Menq** (Co-PI: Richard Bailey), International Business Machines Corporation, 11/1/89 to 10/31/91, \$60,000 plus IBM furnished equipment and software of approximate value \$800,000.
5. "Intelligent Planning Environment for Dimensional Inspection in Manufacturing," **Subproject PI: C. H. Menq**, National Science Foundation ERC for Net-Shape Manufacturing (Center Director: Taylan Altan), 7/1/89 to 4/30/91, \$119,282.
4. "Scan and Gear Measurement Software," **Co-PI: C. H. Menq** (PI: D. Houser), State of Ohio, Department of Development, 4/1/88 to 9/15/90, \$222,174 plus industrial co-sponsor furnished equipment of approximate value \$150,000.
3. "Dimensional Inspection of Manufactured Die and Mold Surfaces," **Subproject PI: C. H. Menq**, National Science Foundation ERC for Net-Shape Manufacturing (Center Director: Taylan Altan), 5/1/87 to 6/30/89, \$114,305.
2. "Study of Automated Inspection Systems for Manufactured Dies," **Subproject PI: C. H. Menq**, National Science Foundation ERC for Net-Shape Manufacturing (Center Director: Taylan Altan), 7/1/86 to 12/31/86, \$25,122.
1. "A Computer-Aided Kinematic Tool for Robot Motion Off-Line Programming," **PI: C. H. Menq**, The Ohio State University/Office of Research and Graduate Studies, 7/1/86 to 6/30/87, \$15,000.

GRADUATE STUDENTS ADVISED

A. Degrees Completed

Ph.D. Students:

1. J. H. Borm (Summer/1988) - "Improvement and Characterization of Robot Positioning Accuracy for Off-line Programming"
2. J. L. Wong (Spring/1989) - "Computer Integrated Dimensional Inspection of Manufactured Dies, Molds, and Other Complex Shaped Objects" (Co-adviser: C. H. Menq, Advisor: T. Altan)
3. J. Y. Lai (Spring/1989) - "Pressure and Position Control Strategies of Pneumatic Systems" (Co-adviser: C. H. Menq, Advisor: R. Singh)
4. J. S. Chen (Summer/1989) - "Dynamic Modeling and Payload Adaptation of a One-link Flexible Manipulator"
5. H. T. Yau (Winter/1991) - "An Intelligent Planning Environment for Dimensional Inspection of Manufactured Objects Using Coordinate Measuring Machines"
6. B. Sarkar (Summer/1991) - "Modeling and Manufacturing of Objects with Multiple Features Based on Measurement Data"
7. Z. Xia (Spring/1992) - "Dynamic Modeling and Control of Multi-link Flexible Manipulators"
8. K. C. Hsia (Spring/1993) - "Discrete Time Model Regulation Control for Systems with Uncertain Dynamics"
9. H. Y. Feng (Fall/1993) - "A Flexible Ball-end System Model for Cutting Force and Machining Error Prediction"
10. Z. Yan (Spring/1994) - "Geometric Tolerance Evaluation and Uncertainty Analysis of Coordinate Metrology"
11. B. Chen (Summer/1994) - "Characterization of Functional Requirements and Functional Tolerances for Concurrent Design and Manufacturing"
12. E. M. Lim (Winter/1995) - "Integrated Machining and Dimensional Control for Die & Mold Manufacturing"
13. N. L. Lee (Summer/1995) - "Feature Extraction from Discrete Range Data for Reverse Engineering"
14. B. D. Yang (Autumn/1996) - "Contact Kinematics of Friction Interfaces and Applications to the Prediction of Resonant Response of Frictionally Constrained Turbine Blades "
15. S. Mittal (Autumn/1998) - "Principles For The Design And Development Of Large Travel Magnetic Suspension Actuators "

16. X. Su (Winter/1999) – “Generation, Measurement, and Reverse Engineering of Three-Dimensional Gears” (Co-adviser: C. H. Menq, Advisor: D. Houser)
17. J. J. Chen (Winter/1999) – “Prediction of Periodic Forced Response of Frictionally Constrained Turbine Blades”
18. T. S. Shen (Autumn/2000) - “Multiple Sensor Integration for Rapid and High-Precision Coordinate Metrology”.
19. H. Zhu (Autumn/2000) - “A Hybrid Approach to Automatic Feature Recognition for Multiple Applications in Concurrent Engineering”.
20. J. Huang (Winter/2001) – “Geometric Feature Extraction and Model Reconstruction from Unorganized Points for Reverse Engineering of Mechanical Objects with Arbitrary Topology”.
21. W. Lu (Spring/2001) – “Modeling of Microslip Friction and Design of Frictionally Constrained Turbine Blade Systems”.
22. X. Shan (Spring/2001) - “Development and Control of An Ultra Precision Magnetic Suspension Stage”.
23. S.K. Kou (Spring/2003) – “Development of An Improved Magnetic Suspension Stage and Its Applications to Nano-imprinting and Nano-metrology”.
24. Y.J. Oh (Winter/2006) – “Prediction of Steady State Response in Dynamic Mode Atomic Force Microscopy and Its Applications in Nano-Metrology”.
25. E. Cigeroglu (Spring/2007) - “Development of Microslip Friction Models and Forced Response Prediction Methods for Frictionally Constrained Turbine Blades.”
26. J.H. Kim (Summer/2007) – “Ultra Precision Visual Servo Control of Micro Objects.”
27. J. Gobbalipur-Ranga (Autumn/2008) - “Multi-axis Probing System for Nano-metrology.”
28. Y.K. Jeong (Winter/2009) – “High-speed Atomic Force Microscopy.”
29. Z. Zhang (Spring/2009) - “Magnetic Tweezers: Actuation, Measurement, and Control at nanometer Scale.”
30. Y. Huang (Summer/2009) - “Active Control and Adaptive Estimation of An Optically Trapped Probing System.”
31. J. Wan (Summer/2009) - “In Situ Optically Trapped Probing System for Molecular Recognition and Localization.”
32. Fei Long (Autumn/2015) – “Three-dimensional Motion Control of a Magnetically Propelled Micro Particle Using a Hexapole Magnetic Actuator”
33. Zhen Liu (Spring/2017) - “Dynamic force sensing and direct force control enabling dynamic mode atomic force microscopy.”

M.S. Students

1. H. Chang (Summer/1987) - "Characterization of Flexible Arm Control"
2. H. T. Yau (Spring/1988) - "Knowledge-Based Approach Toward Multivariable Control System Design"
3. K. C. Sahoo (Spring/1988) - "Localization of 3-D Objects Using Surface Description and Tactile Sensing"
4. L. Subramanian (Summer/1988) - "Application of Learning Control to Robotic Trajectory Tracking"
5. P. Chidamparam (Summer/1989) - "Friction Damping of Two Dimensional Motion and Its Application in Vibration Control"
6. T. H. Kung (Summer/1990) - "On the Learning Control in Robotics Trajectory Tracking"
7. G. W. Lai (Summer/1990) - "Statistical Comparative Analysis for Dimensional Quality Evaluation Using Coordinate Measurement Machine"
8. L. Bragg (Summer/1990) - "Active Control of A Quadruped Running Machine" (Co-adviser: K. Waldron)
9. Schultz (Autumn/1990) - "The Design of A Water Sampling Device for Oceanographic Profiling"
10. J. J. Chen (Spring/1991) - "Precision Tracking Control of MIMO Discrete-time Non-minimum phase Systems"

11. D. Yang (Summer/1991) - "Evaluation of Form Tolerances and Compensation for Form Errors Using Discrete Measurement Data"
12. C. Che (Autumn/1991) - "Scanning Compound Surfaces with No Existing CAD Model by Using Laser Probe of A Coordinate Measuring Machine"
13. W. L. Cheng (Spring/1992) - "CAD Directed Dimensional Inspection of Deformable Objects Using Coordinate Measuring Machine with Laser"
14. P. Lim (Spring/1992) - "Feature Accessibilities and Path Planning for Dimensional Measurement Using Coordinate Measuring Machines"
15. L. Frye (Summer/1992) - "Experimental Study of Cutting Force System in Ball-end Milling Process"
16. M. L. Chu (Autumn/1992) - "Dynamic Analysis and Design of Friction Dampers in Gas Turbine Engines"
17. P. Smith (Summer/1993) - "The Manufacture of EDM Electrodes with Special Emphasis on High-speed Milling of Graphite"
18. Craycraft (Summer/1993) - "Evaluation of the Thermal Growth in a Cincinnati Milacron T-10 Horizontal Machining Center"
19. S. Kim (Summer/1994) - "Precision Tracking Control of Two Axis Feed Drives"
20. J. L. Yang (Winter/1995) - "Vision Based Coordinate Sampling of 3D Objects"
21. C. S. Cheng (Winter/1995) - "Variance Analysis of Geometric Tolerance Evaluation"
22. C. K. Fung (Spring/1995) - "Application of Bi-Causal Inverse Models in Precision Tracking Control"
23. M. Catalan (Summer/1995) - "Design of a Radiation Shielded CCD Camera Assembly"
24. Y. M. Hong (Summer/1995) - "Feature Based Inspection Planning of Coordinate Measuring Machines"
25. T. S. Shen (Spring/1996) - "Measurements of Multi-Feature Objects Using Pattern-Encoded Structure Light"
26. C. T. Chiu (Spring/1996) - "Modeling of Axisymmetrical Objects Based on Discrete Measurement Data"
27. N. Chaviengpob (Spring/1996) - "Design of Bi-Causal Inverse Models for Non-minimum Phase Systems"
28. R. Cao (Spring/1997) - "Design and Control of A Two-Dimensional Magnetic Actuator"
29. S. Admojo (Spring/1997) - "Modeling and Control of An Active Magnetic Bearing System with A Flexible Shaft and Rigid Disks"
30. Shui (Summer/1997) - "Study of An Electric Motor Controlled Pneumatic Suspension"
31. K. Xu (Spring/1998) - "Recognition of Paper-Based Engineering Drawings"
32. S. H. Chen (Summer/2000) - "Feature Calculation of Axisymmetric Objects Based on Discrete Measurement Data"
33. J. Shi (Summer/2000) - "Large Travel Motion Control Of A Magnetically Levitated Stage"
34. J.H. Kim (Spring/2003) - "Three Dimensional Micro Optical Metrology and Visually Guided Micro Alignment and Manipulation".
35. J. Y. Lee (Spring/2003) - "Development of A Laser Vibrometer for 3D Micro Structures and Components".
36. S.H. Ko (Spring/2003) - "Self Calibration of A Visually Guided Coordinate Measuring System".
37. Y. Huang (Summer/2004) - "A Long Range Linear Motion Measurement System With Subnanometer Resolution"
38. J. Gobbalipur-Ranga (Summer/2004) - "Design and Development of A Magnetic Resonance Force Microscope that Operates in Air"
39. Z. Zhang (Summer/2005) - "Development of A Compact Six-axis Magnetic Levitation Stage"
40. M. Bloomberg (Winter/2006) - "Industrial Aero-Derivative Gas Turbine Fuel System Dynamic Analysis"
41. V. Nartarajain (Autumn/2006) - "Estimation of Switching Surface in Hybrid Systems and Its Application to the Control of Dynamic Tapping"
42. K. Hu (Spring/2007) - "Design, Implementation, and Control of A Compact Six-Axis Compliant Stage."

43. A. Nagose (Autumn/2009) – “Visually Guided Manipulation of Micro Particles.”
44. K. Huang (Winter/2010) - “Design and Modelling of Three-Dimensional Magnetic Tweezers.”
45. Shiwen Ai (Autumn/2011) - “Sensing and Control of Tip-sample Interaction Force of a Three-axis Compliant Micro-Manipulator.”
46. Yanhai Ren (Autumn/2016) – “Modeling and Control of 5-axis Compliant Microscopic Manipulators.”
47. Honghui Liu (Spring/2018) – “Active control of microscope objective lens enabling motion tracking of microscopic objects.”

B. Students in Progress

Ph.D. Students

34. Yanhai Ren (Summer/2019) – “Mechanical signatures permissive for epithelial-to-mesenchymal transition in thyroid cells.”
35. Ta-Min Meng (Summer 2020) - “Motion Control and Force Sensing Rendering Three-dimensional Scanning Probe Microscopy.”

M.S. Students

POSTDOCTORAL RESEARCHERS

A. Completed

1. Dr. Z. Yan (7/1/94 – 6/30/01) - “Uncertainty Analysis of 3D Coordinate Metrology”.
2. Dr. J. Zhang (2/1/98 – 11/30/00) - “Laser Interferometer Measurement”.
3. Dr. B. D. Yang (3/1/98 – 6/30/01) - “Contact Kinematics Of 3D Friction Contact”.
4. Dr. T. S. Shen (1/1/2001 – 12/31/2001) – “Multiple Sensor Integration For Rapid And High-Precision Coordinate Metrology”.
5. Dr. S. Wang (1/1/2002 – 6/30/2002) – “Recognition of Feature Constraints from Unorganized Point Clouds”.
6. Dr. N. An (3/1/2002 – 2/20/2005) – “Development of Improved Models and Prediction Methods for Friction Dampers”.
7. Dr. S. H. Lee (4/1/2004 – 3/31/05) – “Magnetic Levitation”.
8. Dr. Ming-Chieh Cheng (10/25/2007- 2/28/2009) – “Force Sensing in Photonic Force Microscopy”
9. Dr. Z. Zhang (7/1/2009 – 5/31/2010) - “Magnetic Tweezers: Actuation, Measurement, and Control at nanometer Scale.”
10. Dr. J. Gobbalipur-Ranga (1/20/2009- 7/31/2010) - “Five-axis Probing System enabling three-dimensional atomic force microscopy.”
11. Dr. Daisuke Matsuura (4/1/2008 – 5/20/2011) – “Noncontact Manipulation of Microscopic Particles Using Three-Dimensional Magnetic Tweezer and Three-Axis Piezo.”
12. Dr. Yuliang Wang (1/15/2010 – 8/31/2012) “Mechanical Property Characterization of Metastatic Cancer Cells.”
13. Dr. Y.K. Jeong (4/1/2009 – 3/31/2013) – “Real-Time In Situ Mechanical Property Mapping of Live Cells Using Dynamic-mode Atomic Force Microscopy.”
14. Dr. Peng Cheng (10/15/2010- 7/31/2015) – “Actively Controlled Optical Trapping and Its Application to Extra/intra Cellular Scanning.”

DEPARTMENT/COLLEGE SERVICE

Member of ME Ph.D. Qualifying Exam Committee, Winter 1988 - Autumn 1989.
 Member of ME Graduate Study Committee, Autumn 1988 - Summer 1991.

Member of ME Faculty Search Committee, Control and System Dynamics Area, 1990.
Chair of Dynamic Systems, Control, and Measurement Group, 1993 - 1994.
Member of ME Executive Committee, Summer 1993 - summer 1994.
Member of ME Ph.D. Qualifying Exam Committee, Autumn 1993 - Summer 1995.
Member of ME Faculty Search Committee, Design for Manufacturing Area, 1995.
Member of ME Graduate Study Committee, Summer 1994 - Summer 1997.
Chair of ME Graduate Study Committee, Autumn 1995 - Summer 1997.
Member of ME Executive Committee, Autumn 1995 - Summer 1997.
Member of ME P&T Committee, 1996 - 1998
Chair of ME P&T Committee, 1997 – 1998
Member of Staff Committee, 2000
Member of Targeted Search Committee, 2000-2001
Member of College P&T Committee, 2000-2001
Chair of ME Faculty Search Committee, Design for Manufacturing Area, 2002-2003.
Member of ME Faculty Search Committee, Control Area, 2002-2003.
Member of ME Graduate Study Committee, Autumn 2002 - Summer 2003.
Member of ME Honor and Nomination Committee, Autumn 2003 – Autumn 2005.
Member of ME P&T Committee, January 2004 – December 2006.
Chair of ME P&T Committee, January 2005 – December 2005.
Chair of ME Faculty Search Committee, Design Area, 2004-2005.
Member of ME Graduate Study Committee, Autumn 2007 – Spring 2009.
Member of ME PhD Program Working Group, Autumn 2007 - 2008.
Chair of MAE Faculty Search Committee, Dynamic System and Design Area, 2010-2011.
Member of MAE P&T Committee, Autumn 2010 – Spring 2014.
Chair of MAE P&T Committee, 2012 – 2014.
Chair of ME Faculty Search Committee, Robotics and Automation, 2014-2015.
Chair of ME Faculty Search Committee, Robotics and Automation, 2015-2016.
Member of ME Faculty Search Committee, Robotics and Automation, 2016-2017.
Member of MAE Honor and Nomination Committee, Autumn 2010 – present.