Marvin H. Cheng

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Employment

Center for Disease Control and Prevention (CDC) / National Institute for Occupational Safety and Health (NIOSH)

- **Assistant Coordinator**, Center for Occupational Robotics Research, 01/2022 – present.
- **Team Chief**, the Safety Controls Team (SCT) in the Protective Technology Branch/Division of Safety Research, 04/2021 – present.
- **Research General Engineer**, the Safety Controls Team (SCT), 09/2018 – present.
- **ANSI/A3 Standard Committee Member**, Association of Advancing Automation, 07/2020 – present.
    - Safety Requirements for Industrial Robots and Robot Systems, ANSI/A3 R15.06.
    - Safety Requirements for Industrial Mobile Robots and Robot Systems, ANSI/A3 R15.08.
- **Adjunct Associate Professor of Embry-Riddle Aeronautical University**, 10/2018 – 12/2023.

Embry-Riddle Aeronautical University

- **Associate Professor**, the Department of Engineering, 08/2017 – 09/2018.

West Virginia University

- **Assistant Professor**, the Department of Mechanical and Aerospace Engineering, 08/2010 – 05/2017.

Georgia Southern University

- **Assistant Professor**, Director of Mechatronics and Measurement Lab, the Department of Mechanical Engineering, 08/2006 – 07/2010.

Education

Purdue University, West Lafayette, Indiana — December, 2005
Ph.D. Mechanical Engineering

National Sun Yat-Sen University, Kaohsiung, Taiwan — June 1996
Master of Engineering

National Sun Yat-Sen University, Kaohsiung, Taiwan — June 1994
Bachelor of Engineering

Industrial Experience

- **Indiana Research Institute,** Senior Control Engineer, Columbus, Indiana, 01/2006 – 06/2006.
- **National Synchronous Radiation Research Center,** Research Engineer, Hsinchu, Taiwan, 09/1997 – 07/1999.
- **Industrial Development Bureau,** Instructor of Industrial Training Course, Taiwan, 03/1997.
- **Industrial Technology Research Institute,** Research Engineer, Hsinchu, Taiwan, 08/1996 –

09/1997.

Other Academic Experience

Teaching Assistant, Purdue University, West Lafayette, Indiana, 08/2000 – 12/2005.

- Develop lab material in the following courses: Dynamics, System Modeling, Digital Control, and Mechatronics.

Research Assistant, Purdue University, West Lafayette, Indiana, 08/1999 – 08/2005.

- Develop algorithms of adaptive sampling for fast atomic force microscopy sampling.
- Conduct research on innovative motion sensor used for diagnosis of hydraulic pump.
- Conduct research on controller implementation with limitation of finite wordlength.

Research Assistant, Purdue University, West Lafayette, Indiana, 08/2004 – 08/2005.

- Develop the evaluating and training system of Oral English Proficiency Program for instructors in the Department of English.

Grants and Funded Research

- *Center for the Occupational Robotics Research*, the National Institute for Occupational Safety and Health / CDC, $6.05M, 2017 ~ 2026, as Assistant Coordinator (Administration).
- *Research Laboratory Infrastructure PTB*, the National Institute for Occupational Safety and Health / CDC, $349,600, 2022 ~ 2024, as Team Lead (Administration).
- *Feasibility Assessments of Engineering Control and PPE Concepts*, the National Institute for Occupational Safety and Health / CDC, $129,432, 2022 ~ 2024, as Team Lead (Administration).
- *Smart Masonry Robot for Struck-by Hazard Prevention*, the National Occupational Research Agenda (NORA) grant, $200,000, 2024 ~ 2028, with C.-J. Liang, PI.
- *Modeling Collision of Human-Robot Interaction in a Collaborative Workspace*, the National Institute for Occupational Safety and Health, $18,000, 2023, PI.
- *Laboratory Modernization*, the National Institute for Occupational Safety and Health, $56,217, 2023, PI.
- *Investigation on Safety and Trust When Working Alongside Industrial Mobile Robots*, the National Occupational Research Agenda (NORA) grant, $200,000, 2022 ~ 2026, with J. Haney, Co-PI.
- *Air-Bubble Cushioning Liners to Improve Construction Helmet Shock Performance*, the National Occupational Research Agenda (NORA) grant, $200,000, 2022 ~ 2026, with C. Pan, Co-PI.
- *Evaluation of mobile robot safety and human-robot interaction in workspace*, the National Institute for Occupational Safety and Health, $25,000, 2022, with J. Haney, Co-PI.
- *Smart Path Planning of Collaborative Robots for Worker Safety*, the National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention (CDC), $192,000, 2019 ~ 2023, PI.
- *Improving Driver Vehicle Interface (DVI) in Police Cruisers for Operational Safety*, the National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention (CDC), $200,000, 2019 ~ 2023, Co-PI.
- *Improving Safety of Human-Robot Interaction*, the National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention (CDC), $200,000, 2018 ~ 2022, Co-PI.

- *Contact avoidance between human workers and collaborative robots*, the National Institute for Occupational Safety and Health 2019, $47,500. PI.
- *Development of Mobile Robots for Student Competition Teams*, Argosy Research Inc., 2018, $34,482 (NTD$1,000,000). PI.
- *Development of Robotic Device with Virtual Interaction between Patients and Occupational Therapist*, Ministry of Science and Technology, Taiwan, 2018, $25,862 (NTD$750,000). PI.
- *Long Term Monitoring of Power Usage*, Industrial Technology Research Institute, 2017, $20,270. PI.
- *Workshop of Cyberphysical Systems*, National Science Foundation, 2017, $800.
- *Ethanol Engine Emission Testing*, Orthman Energy LLC, 2017, with H. Li and S. Wayne, $30,000. Co-PI.
- *NASA's Centennial Challenges: Sample Return Robot Challenge*, NASA, 2016, with Y. Gu and J. Gross, $750,000, Co-PI.
- *Spatial Resolution Enhancement Method for Sensor Array*, 2016 PICOTEST Co., Ltd., $20,000, PI.
- *Direct Write Technology of Lead-Free Energy Harvesting Array*, 2016 Moldex3D Co., Ltd., $20,000, PI.
- *NASA's Centennial Challenges: Sample Return Robot Challenge*, NASA, 2015, with Y. Gu and J. Gross $100,000. Co-PI.
- *Development of Wearable Robotic System with Human Motions*, 2014 West Virginia EPSCoR Seed Grant, $19,938. PI.
- *NASA's Centennial Challenges: Sample Return Robot Challenge*, NASA, 2014, with Y. Gu, $7,000. Co-PI.
- *Synthetic Skin for Pressure and Strain Sensing with Energy Harvesting*, 2013 West Virginia EPSCoR Seed Grant, $20,000. PI.
- *Development of energy harvester of piezoelectric device with adjustable resonant frequency*, 2012 WVU Senate Grant, $11,740. PI.
- *Synthetic Skin for Pressure and Strain Sensing with Energy Harvesting for Aircrafts*, 2012 West Virginia EPSCoR Seed Grant, $15,000. PI.
- *Professional Development Grant*, 2009, Georgia Southern University, $1,880. PI.
- *Vibration Measurement of Piezo-cantilever Beam*, 2009, Paulson Technology Research Awards, $5,023. PI.
- *Robotic Ink Jet Printing*, 2008 Paulson Technology Research Awards, $1,195. PI.
- *Development of Instruction Competition*, 2007, Georgia Southern University, $17,634. PI.
- *Professional Development Grant*, 2007, Georgia Southern University, $2,025. PI.
- *Diagnosis of Pump Systems for High Power Engine*, 2006, Cummins, $45,000. PI.
- *Networking Controller for Fan Coil Systems*, 1997, Industrial Development Bureau, Taiwan, $46,138. PI.
- *Advanced Control of Indoor Air Quality Monitoring System*, 1997, Bureau of Energy, Ministry of Economic Affairs, Taiwan, with H.C. Chiang, H.C. L, and K.S. Yang, $109,375. Co-PI.

- *Development of Networking Controller for HVAC System*, 1996, Industrial Technology Research Institute, Taiwan, $61,538. PI.

Journal Articles

1. **M.H. Cheng**, J. Guan, H.K. Dave, R.S. White, R.L. Whisler, and J.V. Zwiener, "Designing an Experimental Platform to Assess Ergonomic Fac-tors in Law Enforcement Vehicles during Mission-Based Routes," *Machines*, submitted.
2. **M.H. Cheng**, H. Camargo, and E.G. Bakhoum, "Developing a Cyber-Physical Rehabilitation System for Virtual Interaction between Patients and Occupational Therapists," *Machines*, submitted.
3. C.-J. Liang, T.-H. Le, Y. Ham, B.R.K. Mantha, **M. H. Cheng**, and J.J. Lin, "Ethics of Artificial Intelligence and Robotics in the Architecture, Engineering, and Construction Industry", *Automation in Construction*, vol.162, 105369, 2024.
4. **M.H. Cheng**, Y. Li, H. Camargo, and E.G. Bakhoum, "Sustainable Energy Harvesting Mechanism with Flow-Induced Vibration," *Machines*, vol. 11, no. 9, 902, 2023.
5. C.-J. Liang and **M. Cheng**, "Trends in Robotics Research in Occupational Safety and Health: A Scientometric Analysis," the *International Journal of Environmental Research and Public Health*, vol. 20, no. 10, 5904, 2023.
6. C.-Y. Chen, M.-H. Cheng, **M. Cheng**, and C.-F. Yang, "Using iBeacon Components to Design and Fabricate Low-Energy and Simple Indoor Positioning Method", *Sensors and Materials*, vol. 35, no. 3, pp. 703-722, 2023.
7. E.G. Bakhoum and **M.H. Cheng**, "Direct Detection of Alpha Particles with Solid-State Electronics," the Physics Teacher, vol. 60, no. 8, pp. 681-683, 2022.
8. E.G. Bakhoum, C. Zhang, and **M.H. Cheng**, "Real Time Measurement of Airplane Flutter via Distributed Acoustic Sensing," *Aerospace*, vol. 7, no. 9, pp. aerospace-865469, 2020.
9. E. Bakhoum and **M.H. Cheng**, "3-axis, ultrahigh-sensitivity, miniature acceleration sensor," *IEEE trans on Components, Packaging and Manufacturing*, vol. 8, no. 2, pp. 244-250, 2018,
10. Y. Gu, N. Ohi, K. Lassak, J. Strader, L. Kogan, A. Hypes, S. Harper, B. Hu, M. Gramlich, R. Kavi, R. Watson, **M. Cheng**, and J. Gross, "Cataglyphis: An Autonomous Sample Return Rover*," J. of Field Robotics*, vol.35, no.2, pp. 248-274, 2018.
11. E. Bakhoum, **M.H. Cheng**, and R.A. Kyle, "Low-Cost, High-Accuracy Method and Apparatus for Detecting Meat Spoilage," *IEEE trans. on Instrument and Measurement*, vol. 65, no. 7, pp. 1707-1715, 2016.
12. L. Jiang, Y. Li, and **M.H. Cheng**, "Compensation for Cross-Coupled Dynamics of Dual Twisted-String Actuation Systems," *Journal of Control Science and Engineering*, vol. 2016, Article ID 5864918, 2016.
13. **M.H. Cheng**, K. Flores De Jesus, S.D. Cronin, K.A. Sierros, and E. Bakhoum, "A Versatile Spatial Resolution Enhancement Method for Data Acquisition," *Meas. Sci. Technol*., vol. 26, no. 4, pp.045901, 2015.
14. K. Flores De Jesus, **M.H. Cheng**, L. Jiang, and E. Bakhoum, "Resolution Enhancement Method Used for Force Sensing Resistor Array," *Journal of Sensors*, vol. 2015, Article ID 647427, 2015.

15. E.G. Bakhoum, and **M.H. Cheng**, "Ultraminiature Angular Position Sensor Based on the Beta-Voltaic Principle", *IEEE Trans on Instrumentation and Measurement*, vol. 64, no. 2, pp. 533-540, 2015.
16. E.G. Bakhoum, and **M.H. Cheng**, "High-Accuracy Miniature Dew Point Sensor and Instrument", IEEE Sensors Journal, vol. 15, no. 3, pp. 1482-1488, 2015.
17. **M. H. Cheng**, Y. Li, and E. G. Bakhoum**,** "Controller Synthesis of Tracking and Synchronization for Multi-Axis Motion System," *IEEE/ASME trans on Control System Technology,* vol. 22, no. 1, pp. 378-386, 2014.
18. E.G. Bakhoum, **M.H. Cheng**, and K.M. Van Landingham, "Alpha-Particle-Based Icing Detector for Aircraft," *IEEE trans on Instrumentation and Measurement*, vol. 63, no. 1, pp. 185-191, 2014.
19. E.G. Bakhoum and **M.H. Cheng**, "Advanced optical microphone," *IEEE Sensors Journal,* vol. 14, no, 1, pp. 7-14, 2014.
20. E.G. Bakhoum and **M. H. Cheng**, "Tunable Ultracapacitor," *IEEE trans. on Industrial Electronics,* vol. 60, no. 12, pp. 5313-5619, 2013.
21. **M. H. Cheng,** G. T.-C. Chiu, and M. Franchek**,** "Real-Time Measurement of Eccentric Motion with Low-Cost Capacitive Sensor," *IEEE/ASME trans on Mechatronics,* vol. 18, no. 3, pp. 990-997, 2013.
22. E.G. Bakhoum and **M. H. Cheng**, "Miniature Carbon Monoxide Detector Based on Nanotachnology," *IEEE trans on Instrumentation and Measurement,* vol. 62, no. 1, pp. 240-245, 2013.
23. E.G. Bakhoum and **M. H. Cheng**, "Novel Electric Micromotor for Consumer Electronics Applications," *IEEE trans. on Consumer Electronics,* vol. 58, no. 4, pp. 1103-1109, 2012.
24. E.G. Bakhoum and **M. H. Cheng**, "MEMS Acceleration Sensor with Large Dynamic Range and High Sensitivity," *IEEE J. of Microelectroehanical Systems*, vol. 21, no. 5, pp. 1043-1048, October 2012.
25. **M. H. Cheng**, G. Guo, L.E. Banta, and E. Bakhoum, "Identification of Arm Locomotion and Controller Synthesis for Assistive Robotic Systems," *ICIC Express Letter*, vol. 6, no. 10, pp. 2659-2665, October 2012.
26. E. G. Bakhoum and **M. H. Cheng**, "Miniature Moisture Sensor Based on Ultracapacitor Technology," *IEEE trans. on Components, Packing and Manufacturing Technology*, vol. 2, no. 7, pp. 1151-1157, 2012.
27. E. G. Bakhoum and **M. H. Cheng**, "Frequency-Selective Seismic Sensor," *IEEE trans. on Instrument and Measurement,* vol. 61, no. 3, pp. 823-829, 2012.
28. **M. H. Cheng**, Y. J. Li, E.M. Sabolsky, C.Y. Chen, "Energy Harvesting Device with Adjustable Resonance Frequency," *ICIC Express Letter*, vol. 5, pp. 3315-3320, 2011.
29. **M. H. Cheng**, Y.J. Li, C.Y. Chen, and F. Goforth, "Modeling of Piezoelectric Energy Harvester with Adjustable Resonant Frequency," *International Journal of Intelligent Technologies and Engineering Systems*, vol. 1, pp. 86-92, 2011.
30. **M. H. Cheng,** C.-Y. Chen and E. G. Bakhoum**,** "Synchronization Controller Synthesis of Multi-Axis Motion System," *International Journal of Innovative Computing, Information and Control,* vol.7, no.8, August 2011.

31. E.G. Bakhoum and **M. H. Cheng**, "Novel Electret Microphone," *IEEE Sensors Journal,* vol. 11, no.4, pp.988-994, 2011.
32. V. A. Soloiu, **M. H. Cheng,** and C. Y. Chen**,** "Analytic Solution of Shock Waves Equation with Higher Order Approximation," *Innovative Computing, Information and Control – Express Letters,* vol.4, no.5(B), pp. 1723-1728, October 2010.
33. C. Y. Chen and **M. H. Cheng,** "Backstepping Controller Design for a Manipulator with Compliance," *Innovative Computing, Information and Control – Express Letters,* vol.4, no.5(A), pp. 1991-1996, October 2010.
34. C. Y. Chen and **M. H. Cheng,** "Open Architecture Design of Embedded Controller for Industrial Communication Gateway," *ICIC – Express Letters: Part B,* vol.1, no.1, pp. 51-56, September 2010.
35. **M. H.-M. Cheng** and E. G. Bakhoum**,** "A Simplified Approach of Wordlength Estimation for Digital Controllers in State-Space Representation," *Innovative Computing, Information and Control – Express Letters,* vol.4, no.4, pp. 1295-1300, August 2010.
36. E. G. Bakhoum and **M. H.-M. Cheng,** "Experiment for Teaching a Fundamental Principle in Electrostatics," *Journal of Electrostatics,* vol. 68, no. 3, pp. 249-253, June 2010.
37. E. G. Bakhoum and **M. H.-M. Cheng,** "Novel Capacitive Pressure Sensor," *IEEE Transactions on Microelectromechanical System,* vol. 19, no.3, pp.443-450, 2010.
38. E. G. Bakhoum and **M. H.-M. Cheng,** "Capacitive Pressure Sensor with Very Large Dynamic Range," *IEEE Transactions on Components and Packaging Technologies,* vol. 33, no.1, pp.79-83, 2010.
39. J. Lee and **M. H.-M. Cheng,** "Psychophysical Measurement of Perceptual Sensitivity to Pitch Variations," *Innovative Computing, Information and Control – Express Letters,* vol.4, no.1, February, 2010.
40. **M. H.-M. Cheng,** and G. T-C. Chiu, "A Mechatronic Approach to a Virtual Laboratory Service on Internet," *International Journal of Virtual Technology and Multimedia*, vol. 1, no. 2, pp.140-154, 2010.
41. **M. H.-M. Cheng,** Cheng-Yi Chen, E. G. Bakhoum, and A. Mitra, "Controller Synthesis with the Consideration of Multi-Resolution," *Innovative Computing, Information and Control – Express Letters*, vol.3, no.4(A), pp.1025 – 1030, October 2009.
42. C.-Y. Chen and **M. H.-M. Cheng**, "Adaptive Robust Sensorless Position Control of Integrated Moving Coil Motor and Flexure Mechanism," *Innovative Computing, Information and Control – Express Letters*, vol.3, no.3(A), pp.445 – 450, October 2009.
43. E. G. Bakhoum and **M. H. M. Cheng**, "Electrophoretic Coating of Carbon Nanotubes for High Energy-Density Capacitor Applications," *Journal of Applied Physics,* vol. 105, no. 10, May, 2009.
44. **M. H.-M. Cheng,** G. T.-C. Chiu, and R. Reifenberger, "Fractal Compression and Adaptive Sampling: Reducing the Image Acquisition Time in Scanning Probe Microscopy," *Scanning*, pp. 463 – 473, November/December, 2008.
45. **H.-M. Cheng,** "Digital Controller Synthesis with Restricted Resolution," *Journal of Computers*, vol. 3, no. 4, April, 2008.
46. **H.-M. Cheng,** "A New Approach to Estimate the Required Wordlength of Digital Controller," *ASME Early Career Technical Journal*, vol. 6, no. 1, pp. 31-38, October, 2007.

47. **H.-M. Cheng** and G. T.-C. Chiu, "Theory and Implementation of Finite Precision Controller – Limitation on Sample Rate and Wordlength," *Mechanical Engineering Monthly (Chinese)*, no. 354, January 2005.
48. **H.-M. Cheng**, M.T.-S. Ewe, R. Bashir, and G. T.-C. Chiu, "Modeling and Control of Piezoelectric Cantilever Beam Micro-Mirror and Micro-Laser Array to Reduce Image Banding in Electrophotographic Processes," *J. of Micromechanics and Microengineering*, vol. 11, pp. 487-498, 2001.

Conference Articles

1. **M. Cheng**, H.C. Camargo, J. Haney, "Enhancing Safety in Collaborative Workspaces: Defining Attention and Avoidance Zones Through Path Planning with Mobile Robotic Systems," in *2024 ASME International Mechanical Engineering Congress & Exposition (IMECE2024)*, submitted.
2. **M. Cheng**, C.-J. Liang, and E.G. Dominguez, "Safe Operations of Construction Robots on Human-Robot Collaborative Construction Sites," in *the 41st International Symposium on Automation and Robotics in Construction – ISARC 2024*, Lille, France, June 3-7, 2024.
3. **M. Cheng**, C.-J. Liang, E.A. McKenzie, and E.G. Dominguez, "Identification of Contact Avoidance Zones of Robotic Devices in Human-Robot Collaborative Workspaces," in *the 3rd Modeling, Estimation and Control Conference (MECC 2023)*, Lake Tahoe, NV, October 2-5, 2023.
4. **M. Cheng** and J. Haney, "Real-Time Adjustment of Moving Trajectories for Collaborative Robotic Devices," in *the National Occupational Injury Research Symposium (NOIRS) 2022*, Virtual Conference, May 10-12, 2022.
5. **M. Cheng** and E. Bakhoum, "Tracking Control Design and Implementation of Multiaxial Controller for Social Robotic Device," in *2021 ASME International Mechanical Engineering Congress & Exposition (IMECE2021)*, IMECE2021-70510, Virtual Conference, November 1-4, 2021.
6. C.-Y. Cheng, M.H. Cheng, **M.-H. Cheng**, and S.-H. Chen, "A Simple Indoor Positioning Method Using Low Energy iBeacon Components," in *the 4th Eurasian Conference on Educational Innovation 2021 (ECEI 2021)*, Taitung, Taiwan, February 5 -7, 2021.
7. **M.H. Cheng**, P.-L. Huang, and H.-C. Chu, "Motion Estimation and Path Planning for Assistive Robotic Devices", in *2019 ASME International Mechanical Engineering Congress & Exposition (IMECE2019)*, IMECE2019-12296, Salt Lake City, UT, November 8-14, 2019.
8. **M.H. Cheng**, P.-L. Huang, H.-C. Chu, and L.-H. Peng, "Virtual Interaction between Patients and Occupational Therapist", in *2018 ASME International Mechanical Engineering Congress & Exposition (IMECE2018)*, IMECE2018-87289, Pittsburgh, PA, November 9-15, 2018.
9. **M.H. Cheng**, L. Jiang, S. Wheeler, R. Shisheie, L. Banta, and E. Bakhoum, "Design, Fabrication, and Control of a Twisted-String Actuated Robotic Device," in *2016 American Control Conference*, pp. 1215-1220, Boston, MA, July 6 – 8, 2016.
10. R. Shisheie, L. Jiang, L. Banta, and **M.H. Cheng**, "Modeling and Control of a Bidirectional Twisted-String Actuation for an Upper Arm Robotic Device," in *2015 American Control Conference*, pp. 5794-5799, Chicago, IL, July 1 – 3, 2015.

11. L. Jiang, R. Shisheie, **M.H. Cheng**, and E. Bakhoum "Controller Synthesis for Assistive Robotic Device Using Twisted- String Actuation," in *2015 American Control Conference*, pp. 2248-2253, Chicago, IL, July 1 – 3, 2015.
12. Y.J. Li, **M.H. Cheng**, C.-Y. Chen, "Operating Energy Harvesting Array at Higher Vibration Modes," *the 2nd International Conference on Intelligent Technologies and Engineering Systems* (ICITES 2013), Kaohsiung, Taiwan, December 2013.
13. R. Shisheie, L. Jiang, L. Banta, and **M.H. Cheng**, "Design and Fabrication of an Assistive Device for Arm Rehabilitation Using Twisted String System," *the 9th annual IEEE International Conference on Automation Science and Engineering (IEEE CASE 2013)*, Madison, WI, August 17-21, 2013.
14. L. Jiang, R. Shisheie, **M.H. Cheng**, L. Banta, and G. Guo, "Moving Trajectories and Controller Synthesis for an Assistive Device for Arm Rehabilitation," in *the 9th annual IEEE International Conference on Automation Science and Engineering (IEEE CASE 2013)*, Madison, WI, August 17-21, 2013.
15. Y. Li, **M. H. Cheng,** and E. Bakhoum, "Operation of Energy Harvesting Devices in Different Vibration Modes," in *2013 IEEE EnergyTech*, Cleveland, OH, May 21-23, 2013.
16. Y. Li and **M. H. Cheng** "Circuit Development of Piezoelectric Energy Harvesting Device for Recharging Solid-State Batteries," in *2012 ASME International Mechanical Engineering Congress & Exposition (IMECE2012)*, IMECE2012-88103, Houston, TX, November 9-15, 2012.
17. **M. H. Cheng** and E. Bakhoum, "Adaptive Robust Control of Tracking and Synchronization for Multi-Axis Motion System," in *2011 American Control Conference*, pp. 1-6, San Francisco, CA, June 29 – July 1, 2011.
18. **M. H. Cheng,** C.Y. Chen, and E. Bakhoum, "A Simplified Approach of Wordlength Estimation and Its Application," in *IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM)*, Montreal, Quebec, Canada, July, 2010.
19. **M. H.-M. Cheng,** S. Salekeen, E. Bakhoum, and C.-Y. Chen, "Adaptive Control of Sychronization for Multi-Axis Motion System," in *the IEEE SoutheastCon 2010 (SEC10)*, Charlotte-Concord, North Carolina, USA, March 18-21, 2010.
20. **M. H.-M. Cheng**, C.-Y. Chen, and A. Mitra "Synchronization Controller Synthesis of Multi-Axis Motion System," in *the 4th International Conference on Innovative Computing, Information and Control (ICICIC 2009)*, Kaohsiung, Taiwan, December 7-9, 2009.
21. C.-Y. Chen, **M. H.-M. Cheng,** and C.-F. Yang, "Modified Sliding Mode Speed Control of Brushless DC Motor Using Quantized Current Regulator," in *the 4th International Conference on Innovative Computing, Information and Control (ICICIC 2009)*, Kaohsiung, Taiwan, December 7-9, 2009.
22. **M. H.-M. Cheng**, "Fractal Compression and Adaptive Sampling with HV Partitioning: Accelerating the Scanning Process in Scanning Probe Microscopy," in *the ASME International Mechanical Engineering Congress & Exposition (IMECE09)*, Orlando, Florida, USA, November 13-10, 2009.
23. **M. H.-M. Cheng,** G. T.-C. Chiu, and M. Franchek, "Real-Time Measurement of Eccentric Motion with Capacitive Sensor for Hydraulic Pumps," in *2009 American Control Conference (ACC)*, St. Louis, Missouri, USA, June 10-12, 2009.

24. C.-Y. Chen, F. Hsieh, S.-H. Yu, and **M. H.-M. Cheng**, "Adaptive Position Control of Integrated Linear Actuator and Flexure Mechanism," in *IEEE Conference on Industrial Electronics and Applications (ICIEA 2009)*, Xi'an, China, May 25-27, 2009.
25. **M. H.-M. Cheng** and C.-Y. Chen, "Discrete-Time Controller Synthesis of a Piezoelectric Cantilever Beam with the Consideration of Finite Precision," in *the IEEE SoutheastCon 2009 (SEC09),* Atlanta, Georgia, USA, March 6-8, 2009.
26. **M. H.-M. Cheng** and C.-Y. Chen, "Controller Synthesis of Piezoelectric Cantilever Beam with the Consideration of Finite Wordlength," in *the 3rd International Conference on Innovative Computing, Information and Control (ICICIC2008),* June 2008.
27. C.-Y. Chen and **H.-M. Cheng**, "Robust Adaptive Control for Robot Manipulators with Friction," in *the 3rd International Conference on Innovative Computing, Information and Control (ICICIC2008),* June 2008.
28. **M. H.-M. Cheng,** "Modeling and Measurement of Cylindrical Capacitive Sensor and Parameter Estimation of Hydraulic Pump," in *International Symposium on Industrial Electronics Mechatronics and Applications 2007*, Kaohsiung, Taiwan, November 16-17, 2007.
29. **H.-M. Cheng** and G. T.-C. Chiu, "Finite Precision Controller Implementation with Delta Transform," in *2007 American Control Conference (ACC),* New York City, New York, July 11-13, 2007.
30. **H.-M. Cheng,** A. Desai, and J.-C. Thomassian, "Wordlength Estimation of Digital Controller Synthesis for Inkjet Printer Mechanism," in *IEEE SoutheastCon 2007*, Richmond, Virginia, March 22-25, 2007.
31. C.-Y. Chen and **H.-M. Cheng,** "Motion Synchronization of Dual-Cylinder Electrohydraulic System with Unbalanced Loadings and Uncertainties," in *IEEE Conference on Industrial Electronics and Applications (ICIEA 2007)*, Harbin, China, May 23-25, 2007.
32. **H.-M. Cheng** and G. T.-C. Chiu, "Adaptive Sampling for Atomic Force Microscopy with System Level Motion Constraints," *Proceedings of SPIE Electronic Imaging*, vol. 6065, 60650D, February 2006.
33. **H.-M. Cheng** and G. T.-C. Chiu, "Fractal Compression and Adaptive Sampling for Atomic Force Microscopy," in *IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM)*, Monterey, California, USA, July 2005.
34. **H.-M. Cheng**, "An E-Mail Based On-Line Control Experiment Service for Distance Learning," in *Teaching and Learning with Technology Conference 2005*, West Lafayette, Indiana, February 15-16, 2005.
35. **H.-M. Cheng** and G. T.-C. Chiu, "Finite Precision Controller Implementation – Explore the Coupling between Sample Rate and Wordlength," in *Proc. of the 3rd International Federation of Automatic Control (IFAC) Symposium on Mechatronic Systems*, Sydney, Australia, September 2004.
36. **H.-M. Cheng**, G. T.-C. Chiu, and H. Peng, "RemoteLab – an Email Based On-Line Control Experiment Service," in *2004 American Control Conference (ACC)*, Boston, Massachusetts, January 2004.
37. **H.-M. Cheng** and G. T.-C. Chiu, "Improved AFM Imaging Speed with Adaptive Sampling and Path Planning," in *Proc of the Workshop on Scanning Probe Microscopy*, West Lafayette, Indiana, February 2004.

38. **H.-M. Cheng** and G. T.-C. Chiu, "Finite Precision Controller Implementation – Limitation on Sample Rate," in *IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM)*, Kobe, Japan, June 2003.
39. **H.-M. Cheng**, C.R. Chen, Z.D. Tsai, and J.R. Chen, "Utility Optimization for the Beam Orbit Stability at SRRC," in *IEEE Proc. of the 1999 Particle Accelerator Conference*, pp. 1150-1152, New York, USA, March 1999.
40. **H.-M. Cheng**, J. Chang, and C.-C. Cheng, "Suppresion of Background Noise in Speech," *Proc. of 15th National Conference of the Chinese Society of Mechanical Engineers, Part A*, pp. 637-643, Tainan, Taiwan, November 1998.
41. **H.-M. Cheng**, C.-Y. Chen, and G. T.-C. Chiu, "An Application of Distributed Air-Conditioning Control Network," in *1998 American Control Conference (ACC)*, Philadelphia, Pennsylvania, June 1998.
42. **H.-M. Cheng** and C.-C. Cheng, "Implementation of Distributed Control System for the Remotely Operated Vehicle," in *Proc. of the 1997 Automatic Control Conference*, pp. 773-778, Taipei, Taiwan, March 1997.

Industrial Standards

1. *American National Standard for Industrial Mobile Robots – Safety Requirements, Part 2: Requirements for IMR system(s) and IMR Application(s)*, ANSI/A3 R15.08-2-2023, as a voting member, Association for Advancing Automation, Ann Arbor, MI, USA 2023.
2. *American National Standard for Industrial Robots and Robot Systems – Safety Requirements, Part 3: Use of Industrial Robot Applications*, ANSI/A3 R15.06-3-2024, as a voting member, Association for Advancing Automation, under development.
3. *American National Standard for Industrial Mobile Robots – Safety Requirements, Part 3*, ANSI/A3 R15.06-3-202x, as a voting member, Association for Advancing Automation, under development.

Book Chapters

1. C.-Y. Chen, J.-Y. Shiau, C.-Y. Liu, K.-J. Wu, **M.H. Cheng**, "Chapter 26 Sliding Mode Voltage Control of the DC to DC Buck Converters," *Lecture Notes in Electrical Engineering*, vol. 293, J. Juang, C.-Y. Chen, and C.-F. Yang, editors, Springer, Switzerland 2014.
2. Y.J. Li, **M.H. Cheng**, C.-Y. Chen, "Chapter 146 Operating Energy Harvesting Array at Higher Vibration Modes," *Lecture Notes in Electrical Engineering*, vol. 293, J. Juang, C.-Y. Chen, and C.-F. Yang, editors, Springer, Switzerland 2014.

Technical Presentation and Invited Seminars

- "ASME/IMECE 2023: Human-Robot Collaboration & AI Integration Workshop / Panel: Risk and Safety for HRC," served as the panelist in ASME/IMECE 2023, New Orleans, LA, November 2, 2023.
- "Human-Robot Collaboration in Future Manufacturing Workspaces: Enhancing the Safety and Efficiency," presented in the ErgoX 2023, Washington DC, October 23, 2023.
- "Smart Technology for Reducing Occupational Injuries in the Construction Industry," presented in the U.S. National Institute for Occupational Safety and Health and Taiwan

Institute of Labor, Occupational Safety and Health Video Conference Meeting, Virtual, On-Line, October 4, 2023.

- "Enhancing Safety and Efficiency in Human-Robot Collaboration for Future Manufacturing Workspace," presented in the Integrate Colloquium Series at the University of Wisconsin, Madison WI, April 19, 2023.
- "Understanding Safety and Trust of Human-Robot Interaction," presented in the ErgoX 2022, Atlanta GA, October 15, 2022.
- "Understanding Safety and Trust of Human-Robot Interaction," presented in the Vision Zero Summit Japan, Virtual, On-Line, May 11, 2022.
- "Robotics Research and Applications for Occupational Safety and Health," presented in the 6th Annual Virtual CDC Laboratory Science Symposium, Virtual, On-Line, January 27, 2022.
- "Research on Worker Safety and Robots," served as the panelist in the 2021 National Robotics Initiative Principal Investigators' Meeting, Virtual On-Line, March 11, 2021.
- "Robotics Research and Applications for Occupational Safety and Health," presented in the NYNJ ERC 40th Annual Scientific ERC Meeting, New York, NY, September 20, 2019.
- "Contact Avoidance between Human Workers and Collaborative Robots," presented at Robotics Interest Forum, National Institute for Occupational Safety and Health, Morgantown, WV, May 9, 2019.
- "Emerging Robotics and Exoskeleton Technology: Implications for Worker Safety and Health," American Occupational Health Conference 2019, Anaheim, CA, May 1, 2019.
- "Developments and Applications of Wearable Robotic Systems," presented at Widener University, Chester, PA, May 2018.
- "Developments and Applications of Wearable Robotic Systems," presented at National Sun Yat-Sen University, Kaohsiung, Taiwan, April 2018.
- "Integration of Cyber-Physical Systems with Wearable Robotic Systems," presented at the Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Korea, December 2017.
- "Cyber-Physical Systems with the Integration of Wearable Robotic Systems," presented at National Tsing-Hua University, Hsinchu, Taiwan, November 2017.
- "Developments and Applications of Wearable Robotic Systems," presented at the University of Maine, Orono ME, April 2017.
- "Recent Research and Development of Robotic Systems," presented at National Tsing Hua University, Hsinchu, Taiwan, October 2016.
- "Research of Mechatronic and Robotic Systems at WVU," presented at la Universidad Aeronéutica en Querétaro, Mexico, January 2016.
- "Development of Mechatronic Systems," presented at Cheng-Siu Technical University, Kaohsiung, Taiwan, May 2011.
- "Fractal Compression and Adaptive Sampling for Atomic Force Microscopy," presented at the Texas A&M University, College Station TX, February 2009.
- "Fractal Compression and Adaptive Sampling for Atomic Force Microscopy," presented at the University of Alabama, Tuscaloosa AL, April 2008.

- "Synthesis of Digital Controller with the Limited Resolution," presented at Villanova University, Villanova PA, February 2008.
- "Implementation of Digital Controller with the Consideration of Finite Wordlength," presented at the University of Arkansas, Fayetteville AK, March 2006.
- "Adaptive Sampling Algorithm of Atomic Force Microscopy," presented at National Chung-Cheng University, Chia-Yi, Taiwan, November 2005.
- "Fractal Compression and Adaptive Sampling for Atomic Force Microscopy," presented at North Dakota State University, Fargo ND, April 25, 2005.

Honors and Awards

- Top 12 best paper in the 41st International Symposium on Automation and Robotics in Construction (ISARC 2024), June 2024.
- Alice Hamilton Award for Occupational Safety and Health, nominated, January 2024.
- Outstanding Teacher Award of West Virginia University Statler College of Engineering and Mineral Resources, April 2016.
- IEEE Consumer Electronics Society Chester Sall Award for the second-place best paper in the IEEE Consumer Electronics Transactions, May 2015.
- The George W. Weaver Award, Excellent Teaching, Department of Mechanical and Aerospace Engineering, West Virginia University, April 2015.
- Research Excellence Nomination, Georgia Southern University, March 2010.
- AIM (International Conference on Advanced Intelligent Mechatronics) Academic Travel Grant, August 2005.
- Best Student Paper of the Proceedings of 2005 Advanced Intelligence Mechatronics, August 2005.
- The Magoon Teaching Assistant Award, Outstanding Graduate Student for Excellence in Teaching, May 2005.
- American Control Conference Travel Grant, July 2004.
- TECO (Taipei Economic and Culture Office) Academic Travel Grant, May 2004.
- Purdue University Graduate Student Travel Grant, May 2004.
- Taiwan Electric Power Company University and Research Fellowship, June 1995.
- National Sun Yat-Sen University Student of Distinction, June 1994.
- National Sun Yat-Sen University Excellent Student Award in Mechanical Engineering, (6 times), 1991~1994.
- National Sun Yat-Sen University Excellent Student Award, (4 times), 1991~1994.

Teaching Experience

Teaching Awards:

- Outstanding Teacher Award of West Virginia University Statler College of Engineering and Mineral Resources (2016)
- The George W. Weaver Award, Excellent Teaching, Department of Mechanical and Aerospace Engineering (2015)
- The Magoon Teaching Assistant Award, Outstanding Graduate Student for Excellence in Teaching, May 2005.

Teaching Experience at the National Tsing Hua University (Taiwan):

- Average Student Evaluation Score at NTHU (4.9/5)
- Graduate Course: Nonlinear Control
- Undergraduate Course: Automatic Control System

Teaching Experience at West Virginia University:

- Average Student Evaluation Score at WVU (4.43/5)
- Graduate Courses: MAE 653 Advanced Vibrations, MAE 593G Embedded Systems
- Undergraduate Courses: MAE 211 Mechatronics, MAE 241 Statics, MAE 411 Advanced Mechatronics, MAE 460 Automatic Control, MAE 493Z Microprocessor

Teaching Experience at Georgia Southern University:

- Undergraduate Courses: TMET 4890 Mechanical Control, TENS 2141 Statics, TENS 2142 Dynamics, TMET 3711 Introduction to Engineering Mathematics, TMET 2521 Mechatronics
- Graduate Courses: TMET 7136 Advanced Mechatronics, TMET 7137 Embedded Systems

Professional Service

- Member of *Manufacturing Steering Committee* in NIOSH (since 2019).
- Member of *Robotic Steering Committee* in NIOSH (since 2018).
- Panel Reviewer of National Science Foundation (since 2010).
- Academic Editor of *Journal of Sensors* (since 2018).
- Editor of *International Journal of Intelligent Technologies and Engineering Systems* (2011).
- Editor of *International Journal of Convergence Information Technology* (2009 ~ 2011).
- Publicity Chair of *2010 IEEE/ASME Advanced Intelligent Mechatronics* (AIM 2010).
- Associate Editor of *IEEE/ASME Advanced Intelligent Mechatronics (2010).*
- Associate Editor of *American Control Conference (since 2008).*
- Member of Technical Committee of *the International Symposium on Industrial Electronics, Mechatronics and Applications (2007).*
- Member of Program Committee of *American Control Conference (2016).*
- Reviewer of *IFAC Journal of Control Engineering Practice* (since 2005).
- Reviewer of *IEEE Transactions on Instrumentation & Measurement* (since 2006).
- Reviewer of *ASME Journal of Dynamic Systems, Measurement and Control* (since 2003).
- Reviewer of *Journal of System and Control Engineering* (since 2005).
- Reviewer of *Journal of Scanning* (since 2005).
- Reviewer of *American Control Conference* (*ACC 2004 - 2018*).
- Project reviewer of *National Science Council in Taiwan*.

Other Services

- President of Taiwanese Graduate Student Association (I Love Taiwan Club) at Purdue University (2002).
- University advisor of the robotic team in Langston Chapel Middle School for the LEGO robotic competition of the FIRST League (2007).
- Advisor for Taiwanese Student Association at West Virginia University (2012).
- Members of ABET Evaluation Committee (2011 to 2017)
- Chair and member of Ph. D Qualification Examination Committees (2011 to 2016)
- Advisor of undergrad student: (2007 to 2018, more than 600 students)
- Lab presentation for freshmen and high school senior students (GSU, WVU, and NTHU; 2006 to 2018).

Advised Graduate Student

- Yuejuan Li (2014 PhD), Associate Professor, *Beijing University of Technology*.
- Lei Jiang (2016 PhD), Assistant Professor, *China University of Mining & Technology*.
- Karen Flores de Jesus (2013 Master), *Application Engineer, Shaeffler Group USA*.
- Reza Shisheie (2014 Master), *Robotics Engineer at CO-AX Technology Inc.*
- Jeremy Thompson (2014 Master).
- Qian Mou (2016 Master).
- Corrie Herington (2010 Master).

Undergrad Research Projects

- Identifying Fall Hazards on Construction Sites Using Microdrone Swarming (2023)
- Acquisition and Synthesis of Virtual Workspace for Robotic Devices (2022)
- Motion Prediction of Human Workers in Collaborative Workspaces (2020)
- Design of Autonomous Navigation Robot (2017 ~ 2018)
- NASA Sample Return Challenge (2013 ~ 2016)
- Identification of Human Arm Trajectories (2014 ~ 2016)
- Rocket Navigation Control (2013)
- Controller Design of 3D Printer (2010)

Professional Society Affiliations

- Member of IEEE.
- Member of ASME.
- Member of ISA.