M. Alba Pérez Gracia

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Education

3/99 – 9/03	Ph. D. Mechanical Engineering, Department of Mechanical and Aerospace Engineering, University of California, Irvine, CA, USA.
9/97 – 3/99	Master of Science, Mechanical Engineering, Department of Mechanical and Aerospace Engineering, Univ. of California, Irvine, CA, USA.
9/86 – 1/97	Bachelor of Science, Industrial Engineering (BSIE 1996), specialized in Mechanical Engineering, ETSEIB, Universitat Politècnica de Catalunya, (*BarcelonaTech*), Barcelona, Spain.

Experience

08/17 – present	<u>Chair, ME Department; Assoc. Director of the Measurement and Control Engineering Research Center (MCERC)</u> -- *Department of Mechanical Engineering, College of Science and Engineering, Idaho State University.*
06/16 – 08 / 17	On <u>sabbatical leave</u> at the *Instituto de Robotica i Informatica Industrial (IRII) of Barcelona, Spain*, for the Academic Year 2016-2017.
08/13 – 06/16	<u>Associate Chair and MS in ME Program Director</u> -- *Department of Mechanical Engineering, College of Science and Engineering, Idaho State University.*
08/12 – present	<u>Associate Professor</u> -- *Department of Mechanical Engineering, College of Science and Engineering, Idaho State University.*
08/11 – 08/12	<u>Assistant Professor</u> -- *Department of Mechanical Engineering, College of Science and Engineering, Idaho State University.*
11/08 – 08/11	<u>Ramon y Cajal Researcher</u> – *Institut de Robòtica i Informàtica Industrial, UPC-CSIC, Barcelona, Spain.*
07/04 – 12/08	<u>Assistant Professor</u> -- *Department of Mechanical Engineering, College of Engineering, Idaho State University.*
11/03 – 07/04	<u>Postgraduate Researcher</u> -- *Robotics and Automation Laboratory, UCI*: applied research in kinematic synthesis. Professor J. M. McCarthy.
3/97 – 8/97	<u>Design Engineer</u> -- *MAI, United Technologies Automotive.* Design of housings for electrical automotive components. Contact address: Ctra. Igualada, km 1,5 Pol. Industrial - P.O. Box 106, 43800 Valls (Spain).
12/96 – 3/97	<u>Design Engineer</u> -- *Bitron Industrie España, S.A.* Design of temperature and pressure sensors for appliances and automotive industry. Contact address*:* Bitron Industrie España, C/ Ifni, 24 30, 08930 Sant Adria del Besos, Barcelona (Spain).
1/94 – 6/96	<u>Planning engineer</u> -- *Waste Agency, Departament de Medi Ambient, Catalonia, Spain.* Development of the regional planning for the minimization,

recycling and disposal of the industrial waste. Contact address: C/ Doctor Roux, 80, 08017 Barcelona (Spain).

Publications

Books and Book Chapters

1. Thomas, F. and **Perez Gracia, A.,** editors, *Computational Kinematics,* Springer, 2013.

Refereed Journal Articles in International Publications

1. Heidari, O., Wolbrecht, E., **Perez-Gracia, A**. and Yihun, Y.,"A Task-based Design Methodology for Robotic Exoskeletons", *Journal of Rehabilitation and Assistive Technologies Engineering,* vol. 5, November 2018.
2. Thomas, F. and **Perez Gracia, A**., "On Cayley's Factorization of 4D Rotations and Applications*", Advances in Applied Clifford Algebras*, 26(1), 2016.
3. Hassanzadeh, N. and **Perez Gracia, A.,** "Dimensional Synthesis of Wristed Binary Hands", Journal of Mechanisms and Robotics, 8(2), 021006, April 2016.
4. Yihun, Y., Bosworth, K. and **Perez Gracia, A.,** "Link-based Performance Optimization of Spatial Mechanisms", *ASME Journal of Mechanical Design*, 136(12):122303-122303-11, 2014.
5. Simo Serra, E. and **Perez Gracia, A.,** "Kinematic Synthesis Using Tree Topologies", *Mechanism and Machine Theory,* 72 C:94-113, February 2014.
6. **Perez Gracia, A.,** "Synthesis of Spatial RPRP Closed Linkages for a Given Screw System", *ASME Journal of Mechanisms and Robotics*, 3(2), 2011.
7. Sato, C., Martinez, R.G., Shields, M.S., **Perez Gracia, A.,** and Schoen, M.P., "Behavior of Microbial Fuel Cell in a Startup Phase", *Int. Journal of Environmental Engineering,* 1(1):36-51, 2009.
8. Lai, J.C.K., Schoen, M.P., **Perez Gracia, A**., Naidu, D.S., and Leung, S.W., "Prosthetic Devices: Challenges and Implications of Robotic Implants and Biological Interfaces", *Proc. of the Institution of Mechanical Engineers, Vol. 221, Part H: Journal of Engineering in Medicine, Special Issue on Micro and Nano Technologies in Medicine*, 210:173-183. London, UK, 2007.
9. **Perez Gracia, A.** and McCarthy, J.M., "The Kinematic Synthesis of Spatial Serial Chains Using Clifford Algebra Exponentials", *Proceedings of the Institution of Mechanical Engineers, Part C, Journal of Mechanical Engineering Science*, 220(7): 953-968, 2006.
10. **Perez, A.** and McCarthy, J.M., "Clifford Algebra Exponentials and Planar Linkage Synthesis Equations", *ASME Journal of Mechanical Design*, 127(5): 931-940, September 2005.
11. **Perez, A.** and McCarthy, J.M., "Geometric Design of RRP, RPR and PRR Serial Chains", *Mechanism and Machine Theory*, 40(11):1294-1311, November 2005.
12. **Perez, A.** and McCarthy, J.M., "Dual Quaternion Synthesis of Constrained Robotic Systems", *ASME Journal of Mechanical Design*, 126(3): 425-435, 2004.
13. **Perez, A.** and McCarthy, J.M., "Dimensional Synthesis of Bennett Linkages," *ASME Journal of Mechanical Design*, 125(1): 98-104, March 2003.
14. Collins, C.L., McCarthy, J.M., **Perez, A.** and Su, H., "The Structure of an Extensible Java Applet for Spatial Linkage Synthesis," *ASME Journal of Computing and Information Science and Engineering*, 2(1): 45-49, 2002.
15. **Perez, A.** and McCarthy, J.M., "Bennett's Linkage and the Cylindroid," *Mechanism and Machine Theory*, 37(11): 1245-1260, November 2002.

Refereed International, Peer-reviewed Conference Proceedings:

16. Heidari, O. and **Perez-Gracia, A**., "Virtual Reality Synthesis of Robotic Systems for Human Upper-limb and Hand Tasks", *IEEEVR Conference,* Osaka, Japan, 2019.

17. Deemyad, T., Hassanzadeh, N. and **Perez-Gracia, A.,** "Coupling Mechanisms for Multi-Fingered Robotic Hands with Skew Axes", *IFToMM Symposium on Mechanism Design for Robotics,* Udine, Italy, September 11-13, 2018.

18. Heidari, O., Pourgharibshahi, V., Urfer, A. and **Perez-Gracia, A**., "A New Algorithm to Estimate Glenohumeral Joint Location Based on Scapula Rhythm*", 40th Intl. Conf. of the IEEE Engineering and Medicine in Biology Society (EMBC 2018),* Honolulu, HI, July 17-21, 2018.

19. Makhal, A., Thomas, F. and **Perez-Gracia, A**., "Grasping Unknown Objects in Clutter by Superquadric Representation", *IEEE International Conference on Robotic Computing*, Laguna Hills, CA, USA, Jan 31-Feb 2, 2018.

20. Hassanzadeh, N. and Wegert, M. and **Perez-Gracia, A**., "Synthesis of Spatial 3R Chains with Configuration-Specific Twist System*", ASME IDETC/CIE conferences*, 2017.

21. Thomas, F. and **Perez-Gracia, A**., "A New Insight into the Coupler Curves of the RCCC Four-Bar Linkage", *IFToMM Computational Kinematics conference*, 2017.

22. Roylance, J. and Heidari, O. and **Perez-Gracia, A**. and Kendall, E., "Quantification of Upper-body Synergies: a Case Comparison for Stroke and non-Stroke Victims", *ASME IDETC,* Charlotte, NC, August 2016.

23. Movassagh-Kaniki, R. and Hassanzadeh, N. and Makhal, A. and **Perez-Gracia, A**., "Design of a Multi-palm Robotic Hand for Assembly Tasks*", ASME IDETC*, Charlotte, NC August 2016.

24. Hassanzadeh, N. and Movassagh-Khaniki, R. and **Perez-Gracia, A**., "Design of a Dexterous Hand for a Multi-Hand Task", *RoManSy,* June, 2016.

25. Tamimi, A. and **Perez-Gracia, A.** and Pucheta, M., "Structural Synthesis of Hands for Grasping and Manipulation Tasks", *Advances in Robot Kinematics,* June 2016.

26. Hassanzadeh, N. and Gosh, S. and Robson, N. and Perez-Gracia, A., "Velocity-field Tasks for In-hand Manipulative Synthesis", *Advances in Robot Kinematics, ,* June 2016.

27. **Perez-Gracia, A.** and Thomas, F., "Clifford Algebra Representation of Grasping and Manipulative Hand Actions for Kinematic Synthesis", *Applied Geometric Algebra in Computer Science and Engineering (AGACSE),* Barcelona, July 2015.

28. Thomas, F. and **Perez-Gracia, A**., "On Cayley's Factorization of 3D Rotations and Applications", *Applied Geometric Algebra in Computer Science and Engineering (AGACSE),* Barcelona, July 2015.

29. Hassanzadeh, N., He, X. and **Perez-Gracia, A**., "A Design Implementation Process for Robotic Hand Synthesis", *ASME IDETC/CIE conferences*, Boston, USA, August 2-4, 2015.

30. **Perez-Gracia, A**., "Dimensional Synthesis of One-Jointed Multi-Fingered Hands", *IFToMM Mechanism Design in Robotics conference, Aalborg, Denmark,* June 2015.

31. **Perez-Gracia, A.,** "Synthesis of Multi-fingered Robotic Hands", *1st PANACM Congress*, Buenos Aires, Argentina, 27-29 April, 2015.

32. Makhal, A. and **Perez-Gracia, A.,** "Solvable Multi-Fingered Hands for Exact Kinematic Synthesis", *Advances in Robot Kinematics*, 2014.

33. Batbold, B., Yihun, Y., Wolper, J.S. and **Perez-Gracia, A.,** "Exact Workspace Synthesis for RCCR Linkages", *2013 Computational Kinematics Workshop*, Barcelona, Spain, May 2013.

34. Yihun, Y., Bosworth, K. and **Perez-Gracia, A.,** "Link-based performance optimization of spatial mechanisms", *ASME 2013 International Design Engineering Technical Conferences.*

35. Yihun, Y., Rahman, M.S., and **Perez-Gracia, A.,** "Design of an Exoskeleton as a Finger-Joint Angular Sensor", *2012 IEEE EMBS Conference,* San Diego, CA, August 28-September 1, 2012.

36. Yihun, Y., Miklos, R., **Perez-Gracia, A.,** Reinkensmeyer, D.J., Denney, K. and Wolbrecht, E.T., "Single Degree-of-Freedom Exoskeleton Mechanism Design for Thumb Rehabilitation", *2012 IEEE EMBS Conference,* San Diego, CA, August 28-September 1, 2012.

37. Scott, K. and **Perez-Gracia, A.,** "Design of a Prosthetic Hand with Remote Actuation", *2012 IEEE EMBS Conference,* San Diego, CA, August 28-September 1, 2012.

38. Simo-Serra, E., **Perez-Gracia, A.,** Moon, H. and Robson, N., "Design of Multifingered Robotic Hands for Finite and Infinitesimal Tasks Using Kinematic Synthesis", *2012 Advances in Robot Kinematics conference,* Innsbruck, Austria, June 2012.

39. Simo-Serra, E., Moreno-Noguer, F., and **Perez-Gracia, A.,** "Design of Non-anthropomorphic Robotic Hands for Anthropomorphic Tasks", *ASME International Design Engineering Technical Conferences, IDETC 2011,* Washington DC, USA, August 29-31, 2011.

40. Wolbrecht, E.T., Reinkensmeyer, D.J., and **Perez-Gracia, A.,** "Single Degree-of-Freedom Exoskeleton Mechanism Design for Finger Rehabilitation", *ICORR 2011: Int. Conference on Rehabilitation Robotics,* Zurich, Switzerland, June 29-July 1, 2011.

41. Sands, D., **Perez Gracia, A.,** McCormack, J., and Wolbrecht, E.T., "Design of a Scalable Mechanism for Finger Rehabilitation", *15ᵗʰ IASTED International Conference on Robotics and Applications*, Cambridge, MA, USA, November 1-3, 2010.

42. Crawford, A.L., Molitor, J., **Perez Gracia, A.,** and Chiu, S., "Design of a Robotic Hand and Simple EMG Input Controller with a Biologically-Inspired Parallel Actuation System for Prosthetic Applications", *1st International Conference on Applied Bionics and Biomechanics (ICABB),* Venice, Italy, October 14-16, 2010. *(8 citations)*

43. **Perez Gracia, A.,** "Synthesis of Spatial RPRP Loops for a Given Screw System", *Proc. of the EuCoMeS, 3rd European Conference on Mechanism Science*, Cluj-Napoca, Romania, September 14-18, 2010.

44. Crawford, A.L., and **Perez Gracia, A.,** "Design of a Robotic Hand with a Biologically-Inspired Parallel Actuation System for Prosthetic Applications", *Proc. of the ASME 2010 International Design Engineering Technical Conferences (IDETC/CIE 2010)*, Montreal, Quebec, Canada, August 15-18, 2010.

45. Chen, C.-H., Naidu, D. S., **Perez Gracia, A**., and Schoen, M. P., "A hybrid adaptive control strategy for a smart prosthetic hand", *31st Annual International Conference of the IEEE Engineering in Medicine and Biology Society Conference (IEEE EMBC'09)*, Minneapolis, Minnesota, USA, September, 2-6, pp. 5056-5059, 2009.

46. Chen, C-H., Naidu, D.S., **Perez, A.,** and Schoen, M.P., "Fusion of Hard and Soft Control Techniques for Prosthetic Hand", *Proceedings of the IASTED International Conference on Intelligent Systems and Control (ISC 2008)*, Orlando, FL, USA, November 16-18, 2008.

47. Chen, C-H., Bosworth, K.W., Schoen, M.P., Bearden, S.E., Naidu, D.S., and **Perez, A.,** "A Study of Particle Swarm Optimization on Leukocyte Adhesion Molecules and Control Strategies for Smart Prosthetic Hand", *IEEE Swarm Intelligence Symposium*, St Louis, MO, September 21-23, 2008.

48. Knight, B.M., Schoen, M.P., and **Perez Gracia, A.,** "Distributed Actuation and Shape Control of Ionic Polymer Metal Composites", *Proc. of IMECE, Int. Mechanical Engineering Congress and Exposition*, Chicago, IL, November 2006.

49. Duraisamy, K., **Perez Gracia, A.** and Schoen, M.P., "Vision-Based Kinematic Synthesis of Hand Motion", *Proc. of IMECE, Int. Mechanical Engineering Congress and Exposition*, Chicago, IL, November 2006.

50. Villa-Uriol, M.C., **Perez Gracia, A**. and Kuester, F., "Humanoid Synthesis Using Clifford Algebra", *2006 IEEE International Conference on Robotics and Automation*, Orlando, Florida, May 15-19, 2006.

51. Duraisamy, K., Isebor, O**., Perez, A.,** Schoen, M.P. and Naidu, D.S., "Kinematic Synthesis for Smart Hand Prosthetics", *BioRob 2006: 1st IEEE/RAS Int. Conf. on Biomedical Robotics and Biomechatronics*, Pisa, Italy, February 20-22, 2006.

52. Soh, G.S., **Perez Gracia, A.** and McCarthy, J.M., "The Kinematic Synthesis of Mechanically Constrained Planar 3R Chains", *Proc. of the EuCoMeS, 1st European Conference on Mechanism Science*, Obergurgl, Austria, February 21-26, 2006.

53. **Perez, A.** and McCarthy, J.M., **"**Sizing a Serial Chain to Fit a Task Trajectory Using Clifford Algebra Exponentials", *2005 IEEE International Conference on Robotics and Automation*, April 18-22, 2005, Barcelona.
54. Wolbrecht, E., Su, H.-J., **Perez, A**. and McCarthy, J.M. "Geometric Design Of Symmetric 3-RRS Constrained Parallel Platforms," *ASME International Mechanical Engineering Congress and Exposition* , Anaheim , CA , November 13-19, 2004. **(9 citations)**
55. **Perez, A.,** Su, H.J. and McCarthy, J.M., "Synthetica 2.0: Software for the Synthesis of Constrained Serial Chains", *2004 ASME Design Engineering Technical Conferences, Salt Lake City, September 2004.*
56. Villa-Uriol, M.C., Kuester, F., Bagherzadeh, N., **Perez, A.** and McCarthy, J.M., "Kinematic Synthesis of Avatar Skeletons from Visual Data", *Advances in Robot Kinematics,* June 2004, J. Lenarcic and C. Galletti, eds., Kluwer Academic Publishing, 2004.
57. **Perez, A.** and McCarthy, J.M., "Dimensional Synthesis of CRR Serial Chains", *ASME Design Engineering Technical Conferences*, Chicago, IL, September 2003.
58. **Perez, A.** and McCarthy, J.M., "Dimensional Synthesis of RPC Serial Robots", *International Conference on Advanced Robotics, ICAR 2003*, Coimbra, Portugal, June 2003.
59. **Perez, A.** and McCarthy, J.M., "Dual Quaternion Synthesis of a Parallel 2-TPR Robot," *Proc. of the Workshop on Fundamental Issues and Future Research Directions for Parallel Mechanisms and Manipulators*, October 3-4, 2002, Quebec City, Quebec, Canada.
60. **Perez, A.,** McCarthy, J.M. and Bennett, B., "Dual Quaternion Synthesis of Constrained Robots," *Advances in Robot Kinematics*, (J. Lenarcic and F. Thomas,eds.), pp. 443-452, Kluwer Academic Publ.,Netherlands, 2002.
61. **Perez, A.,** and McCarthy, J.M., "Dimensional Synthesis of Bennett Linkages," *Proceedings of the ASME Design Engineering Technical Conferences*, Baltimore, MD, Sept. 10-13, 2000.
62. **Perez, A.** and McCarthy, J.M., "Dimensional Synthesis of Spatial RR Robots," *Advances in Robot Kinematics*, (J. Lenarcic and M.M. Stanisic, eds.), pp. 93-102, Kluwer Academic Publ., Netherlands, June 2000.

Presentations and Invited Seminars:

- Invited seminar, University of California Irvine, November 2018.
- Invited seminar, Department of Electrical Engineering and Department of Physics, ISU, *The Design of Robotic Hands,* October 2013 and December 2018.
- Invited seminar, Technical University of Catalonia (UPC), Barcelona, Spain, *Challenges in the Design of Better Prosthetic Hands*, February 2011.
- Invited seminar, Institut de Robotica i Informatica Industrial, Barcelona, Spain: *Open Problems in Kinematic Synthesis,* February 2009.
- Invited seminar, Mechanical Engineering Dept., Univ. of Utah*: Kinematic Synthesis Using Clifford Algebras: Theory and Applications*. Speaker: Alba Perez. October 2007.
- Tutorial, IEEE ICRA 2005 Conference*: Robot Design Using Mechanism Synthesis Theory*. Organizer: J.M. McCarthy. Speakers: J.M. McCarthy, Hai Jun Su, Alba Perez. April 2005.
- Tutorial, ASME DETC 2004 Conference*: Robot Design Using Mechanism Synthesis Theory*. Organizer: J.M. McCarthy. Speakers: J.M. McCarthy, Hai Jun Su, Alba Perez. September 2004.

Awards, Research Grants and Research Activity

Awards:

- **2008 Ramon y Cajal Fellowship** from the Spanish Ministry of Science and Innovation. *International competitive award for a 5-year fellowship to perform research in Spain.*
- **1997 Balsells Fellowship.** *To pursue graduate studies at the University of California, Irvine.*

Research Grants and Contracts:

- *Idaho Global Entrepreneurial Mission (IGEM),* 2018-2019: "ARPRI: Augmented Reality Platform for Robotic Systems Design and Interaction". **Funded amount: $215,606.**

- *National Science Foundation,* 2014-2017: "Collaborative Research: ARWED: Augmented Perception for Upper-limb Rehabilitation", Main Institution: Texas A&M, ISU PI: Alba Perez Gracia. **Funded amount: $152,757**.

- *National Science Foundation, National Robotics Initiative,* 2012-2016: "NRI Small: Collaborative Research: A Design Methodology for Multi-fingered Robotic Hands with Second-Order Constraints", Main Institution: Idaho State University, PI: Alba Perez Gracia. **Funded amount: $445,570**. Additional supplemental funds for EU- USA collaboration under this grant: **$47,794.**

- *Acciones Complementarias para Proyectos de Investigación Fundamental no Orientada 2011, Subprograma EXPLORA, Ministry of Science and Innovation 2011 (Spain),* 2011-2012: "PRO-FACES: Programmable Surfaces", PI: Federico Thomas, research team: Alba Perez Gracia and Carme Torras Genis. **Funded amount: 52,000 euros**.

- *National Institute of Health, USA*: Sub-contract from project: "Determinants of the Effectiveness of Robot-Assisted Hand Movement Training", PI: David Reinkensmeyer, Univ. of California, Irvine; 1-year (2010-2011) agreement: Alba Pérez Gracia, UPC, and sub-award holder Eric Wolbrecht, Univ.of Idaho. **Contract amount: $10,000**.

- *Subprograma de proyectos de investigación fundamental no orientada, Ministry of Science and Innovation 2010 (Spain)*, September 2010 – September 2012: "An Extension of Branch and Prune Techniques for the Synthesis and Analysis of Motion of Complex Robotic Systems", PI: Lluís Ros Giralt, research team: Alba Perez Gracia and 9 more. **Funded amount: 75,000 euros**.

- *US Army Medical Research and Materiel Command*, June 2010 – June 2012: "Smart Prosthetic Hand Technology". PI: D. Subbaram Naidu, co-PIs: Jim Lai, Solomon Leung, Marco P. Schoen, Alba Perez Gracia, Alex Urfer and Steve Chiu. **Funded amount: $1,426,122.**

- *US Army Medical Research and Materiel Command*, June 2007 – June 2009: "Smart Prosthetic Hand Technology". PI: D. Subbaram Naidu, co-PIs: Jim Lai, Solomon Leung, Marco P. Schoen and Alba Perez Gracia. Funded amount: **$842,000.**

- *CAES-LDRD,* April 2007 – September 2008 : "Development of Microbial Fuel Cell, fueled by domestic, agricultural, and food processing wastewaters", PI: Dr Chikashi Sato, co-PIs: Malcolm Shields, Marco Schoen, Alba Perez-Gracia

- *NASA Idaho EPSCOR 2006-2007*: "Tumbleweed Microrobots Using Electroactive Polymers", PI: Marco P. Schoen, co-PI: Brian Williams, Alba Perez Gracia.

- *ISU Faculty Research Committee Grant*, May 2005 - May 2007, project: "Use of Robot Synthesis Theory for Characterization of Protein Kinematics". PI: Alba Perez Gracia.

Graduate Research Directed

PhD Dissertations: 4 students graduated with PhD in Engineering and Applied Science.
- O. Heidari, ISU EAS PhD program, ongoing.
- T. Deemyad, ISU EAS PhD program, ongoing.
- S. Medasetti, ISU EAS PhD program, ongoing.
- A. Makhal, *Autonomous Robotic Grasp Planning by Superellipsoid Representation,* PhD Dissertation, ISU, April 2018.
- N. Hassanzadeh, *Kinematic Synthesis Strategies for the Design of Robotic Hands*, PhD Dissertation, ISU, April 2017.
- Y. Yihun, *A Synthesis Methodology for the Design of Exoskeletons,* PhD Dissertation, ISU, May 2014.
- A. Crawford, *Design of a Novel Hierarchical Prosthetic Hand Actuation System,* PhD Dissertation, ISU, April 2010.

Master's Theses: 19 students graduated with MS in ME or MCE.
- Cenjiong Gao, Nusrat Farhin, current MS students.
- V. Pourgharibshahi, *Error Analysis in Marker-Based Motion Capture Systems,* April 2018.
- M. Chowdury, *Mapping of Human Hand Actions using Motion Capture for Dexterous Robotic Telemanipulation*, January 2018 .
- R. Movassagh, *Design of Single, Multi-fingered Robotic Hands to Perform Binanual Tasks*, ISU, April 2017.
- K. Kalavapudi, ISU, January 2017.
- T. Deemyad, *Design of a Five-fingered Underactuated Hand for Two-position Tasks*, May 2016.
- J. Roylance, *The Quantification of Upper-body Synergies: A Case Comparison for Stroke and Non-Stroke Victims*, MS Thesis, ISU, May 2016.
- S. Sharif, *Position Control Strategies of Barrett Hand*, MS Thesis, ISU, May 2016.
- A. Tamimi, *Enumeration, structural and dimensional synthesis of robotic hands: theory and implementation,* MS Thesis, ISU, December 2015.
- X. He, *The Robotic Hand Parts Database Design*, MS Thesis, ISU, December 2015.
- Q. Khalid, *Design of a Multi-fingered Robotic Gripper for Agricultural Tasks* , MS Thesis, ISU, December 2014.
- A. Al-shankiti, " *A ROS-based Reconfigurable Controller for Robotic Manipulators",* Master's Thesis, ISU, May 2014.
- K. Scott, "*The Scott Hand – A Decoupled Solution to Robotic Prosthetics*", Master's Thesis, ISU, July 2013.
- W. Lin, "*Fingertips Tracking Force-feedback Control System*", Master's Thesis, ISU, July 2013.
- Md S. Rahman, "*3D Tracking and Pose Recovery of Human Finger Motion for Exoskeleton Design*", Master's Thesis, ISU, May 2013.
- B. Batbold, *Design of 1-dof Parallel Robots Using a Finite-Screw Description of their Workspace*, Master's Thesis, IRI, June 2012.
- D. Alder, *Dynamic Simulation of a Human Hand for Prosthetic Applications*, Master's Thesis, ISU, February 2009.
- H. Ahsan, *3D Computer Vision System for Hand Joint Motion Calculation,* Master's Thesis, ISU, December 2008.
- K. Duraisamy, *Kinematic Synthesis for Smart Hand Prostheses*, Master's Thesis, ISU, December, 2006.
- R. Isaak, *A Study of Overconstrained Linkage Networks*, Master's Thesis, ISU, June, 2006.

International Visiting Scholars

- Fullbright Visiting professor: Dr Martin Alejo Pucheta, CONICET, Argentina: August to November 2012.

Teaching Experience (ISU)

Fall 2012, 2013   **Mechanics of Materials:** Theories of stresses and strains for ties, shafts, beams, columns and connectors. Determination of deflections and the investigation of indeterminate members. An introduction to design. *College of Science and Engineering, Idaho State University.*

Fall 2004-2008, 2011-2013, 2015, 2017, 2018   **Kinematics and Dynamics of Machinery**: Kinematic analysis and design of cams, gears, and linkages; velocity, acceleration and force analysis; kinematic synthesis; balancing; computer-aided analysis and synthesis. *College of Science and Engineering, Idaho State University.*

Fall 2004-2008   **Measurement Systems Laboratory**: Principles of measurement, standards and accuracy, detectors and transducers, digital data acquisition, signal conditioning systems and devices, statistical concepts in measurement, experimental investigation of engineering systems. *College of Science and Engineering, Idaho State University*.

Fall 2005, 2007, 2011, 2014   **Robot Kinematics, Robotics and Automation**: Graduate level courses that introduce the students to several mathematical tools for robot analysis and design: homogeneous matrices, Lie algebras and Clifford algebras. *College of Science and Engineering, Idaho State University*

Spring 2005-2007, 2014-2016   **Machine Design**: Design of mechanical components subject to static and fatigue loads. Design using screws, fasteners, springs, bearings, and welds. Computer-aided design using finite element methods. *College of Science and Engineering, Idaho State University.*

Spring 2005, 2006, 2008, 2012 – 2016, 2019   **Mechatronics**: Basic kinematics, sensors, actuators, measurements, electronics, microprocessors, programmable logic controllers, feedback control, robotics and intelligent manufacturing. *College of Science and Engineering, Idaho State University*.

Spring 2006   **Statics:** Concepts of force vectors and equilibrium with emphasis on free body diagrams. Trusses, beams, frames, centroids, fluid statics, and friction. *College of Science and Engineering, Idaho State University*.

Spring 2007, 2008   **Symbolic Programming:** Introduces symbolic programming language, with emphasis on algebraic, calculus, and linear algebraic manipulations and visualization, with engineering applications. *College of Science and Engineering, Idaho State University*.

Spring 2012, Fall 2013, Spring 2015   **Advanced Kinematic Design:** Graduate level course covering structural and dimensional design of articulated systems, with emphasis on the mathematical background. *College of Science and Engineering, Idaho State University*.

Spring 2013, 2014; Fall 2015   **Robotic Grasping and Manipulation**: Graduate-level course covering robot kinematics and dynamics, screw theory, multi-fingered grasping and manipulability of grasped objects. *College of Science and Engineering, Idaho State University*.

Fall 2014, 2015   **Mechanical Systems Design:** Application of engineering concepts and principles to the design of mechanical systems, including economic,

	environmental, sustainability, and societal considerations. *College of Science and Engineering, Idaho State University.*
Spring 2018	**Introduction to Robotics:** Undergraduate-level course on robotics: motion, forward and inverse kinematics, Jacobian, velocities and static forces, path planning, dynamics and control.

Professional Activities and Affiliations

Memberships

- Member of the American Society of Mechanical Engineers (ASME).
- Member of the Institute of Electrical and Electronic Engineers (IEEE).
- Member of the Society of Automotive Engineers (SAE).

Professional service in journals, conferences and panels

- Member of the Scientific Committee of the Advances in Robot Kinematics conferences (since 2016).
- Member of the Scientific Committee of the *IFToMM MEDER* conference (since 2015).
- Member of the Scientific Committee of the IFToMM ISEMMS (since 2017).
- Associate Editor, *International Federation of Automatic Control* (*IFAC) Mechatronics* journal (2010-2016).
- NSF ad-hoc reviewer (2014).
- Symposium chair (2015, 2016), and symposium co-organizer (2011 and 2014), ASME *International Design Engineering Technical Conferences and Computers in Engineering Conferences (IDETC/CIE).*
- Panelist, *NSF National Robotics Initiative* (June 2012, April 2013)
- Associate Editor, *International Conference on Robotics and Automation* (ICRA 2013, 2014, 2015, 2016, 2017).
- Conference co-chair, *International Federation for the Theory of Machines and Mechanisms (IFToMM)* Computational Kinematics Workshop (2013).
- Program Committee member, *Robotic Science and Systems (RSS) conference*, 2014, 2015.
- Reviewer, journals: Elsevier's Mechanism and Machine Theory; ASME Journal of Mechanisms and Robotics; ASME Journal of Mechanical Design; IEEE Transactions on Robotics; Advances in Applied Clifford Algebras; Proc. of the Inst. of Mech. Eng., Part C: Journal of Mechanical Engineering Science; Int. Journal of Humanoid Robotics; Elsevier's Robotics and Autonomous Systems; Springer's Meccanica.

University Service Activities

- Dean Search Committee, 2017-2018.
- Associate Director of the Measurement and Control Engineering Research Center, 2017-present.
- Associate Chair and ME MS Graduate Program Director, Department of Mechanical Engineering, 2013-2016.
- Student International Olympiad in Mechanism and Machine Science (SIOMMS) mentor, 2016.
- Student Chapter Advisor, SAE, 2011-2015.
- General Education Requirements Committee, Idaho State University, 2007-2008.
- Research Coordinating Council, Idaho State University, 2006-2008.

- Campus Planning Council, Idaho State University, 2005-2008.
- University Library Committee, Idaho State University, 2004-2005.