

## Yu Guo

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### RESEARCH INTEREST

- Nonlinear Dynamics and Controls – Periodic motions, bifurcation and chaos
- Discontinuous Dynamical Systems – Constructed motions, and controls
- Computational Nonlinear Dynamics – Algorithms for periodic motions and chaos
- Nonlinear Dynamical Systems on Chips – Experimental nonlinear dynamics

### EDUCATION

Ph.D. of Mechanical Engineering, Obtained: 08/2013  
Southern Illinois University Carbondale (SIUC)  
Specialization: Dynamical Systems, Vibration and Control

M.S. of Mechanical Engineering, Obtained: 08/2008  
Southern Illinois University Edwardsville (SIUE)  
Specialization: Dynamical systems, Vibration and Control

B.S. of Computer Engineering, Obtained: 08/2006  
South China University of Technology (SCUT)  
Major: Computer Science and Engineering

### ACADEMIC EXPERIENCE

**Midwestern State University**, Assistant\Associate Professor **08/2013 – present**

**Teaching Courses:** *Mechanics of Solids, Engineering Graphics, Electronics, Electronics Lab, Electric Circuits, Electric Circuits Lab, Measurements and Instrumentations, Measurements and Instrumentations Lab, Machine Control Programming Lab, Senior Design Lab, FE Exam Review Session: Mechanics of Solids, FE Exam Review Session: Dynamics.*

**Developed Labs:** *Developed lab curriculum for Measurements and Instrumentations lab, Designed and build lab apparatus for Measurements and Instrumentations lab.*

**Curriculum Development:** *Developed full curriculum for potential Electrical Engineering program.*

**Research:** *Nonlinear Dynamics, Robotics and Control, Computational Mechanics*

### NON-ACADEMIC EXPERIENCE

**Engine Structure & Dynamics Engineer**, Caterpillar **05/2012 – 07/2013**

Structural Dynamics and Vibration Testing

### PROFESSIONAL MEMBERSHIPS / AFFILIATIONS

ASME (American Society of Mechanical Engineers) Membership Since 2008.

CUR (The Council of Undergraduate Research) Membership Since 2013.

## PUBLICATIONS

### Monograph:

1. **Yu Guo** and Albert C. J. Luo (2023), “Periodic Motions to Chaos in a Spring-Pendulum System”, Springer.
2. **Yu Guo** and Albert C.J. Luo (2020), “Bifurcation Dynamics of a Damped Parametric Pendulum”, *Morgan & Claypool Publishers*.
3. Albert C. J. Luo and **Yu Guo** (2013), “Vibro-Impact Dynamics”, *Wiley*.

### Book Chapters:

1. **Yu Guo** and Albert C. J. Luo (2017), “Travelable Period-1 Motions to Chaos in a Periodically Excited Pendulum”, *Regularity and Stochasticity of Nonlinear Dynamical Systems* (D. Volchenkov and X. Leoncini)
2. **Yu Guo** and Albert C. J. Luo (2016), “Periodic Motions to Chaos in Duffing Oscillator via Discretization Technique”, *Complex Motions and Chaos in Nonlinear Systems* (V. Afraimovich, J.A.T. Machado, J.Z. Zhang, Springer) pp. 259-276.
3. **Yu Guo** and Albert C. J. Luo (2011), “Complex motions in a Fermi Oscillator”, *Nonlinear Approaches in Engineering Applications*, (Eds. L. Dai, and R. Jazar, Springer) pp.105-134.
4. A.C.J. Luo and **Y. Guo** (2010), “Complete Bifurcation Behaviors of a Henon Map”, *Dynamical Systems-Discontinuity, Stochasticity, and Time-Delay*, (Eds. Albert C.J. Luo, Springer). pp.37-47.
5. A.C.J. Luo and **Y. Guo** (2009), “Switching and Stick Motions in an Extended Fermi-Acceleration Oscillator”, *Vibro-Impact Dynamics of Ocean Systems and Related Problems*, Lecture Notes in Applied and Computational Mechanics (Eds. Raouf A Ibrahim, Vladimir I Babitsky and Masaaki Okuma, Springer). pp.179-189.

### Journal Articles:

1. **Y. Guo** and A.C.J. Luo (2022), “Period-3 Motions to Chaos in a Periodically Forced Nonlinear-Spring Pendulum”, *Chaos*, 32(10), 103129.
2. **Y. Guo** (2022), “Bifurcations and Harmonic Responses of Period-1 Motions in a Periodically Excited Spring Pendulum”, *Journal of Vibration Testing and System Dynamics*, Vol 6 (2022), Issue 3, pp.297-315
3. **Y. Guo**, A.C.J. Luo, Z. Reyes, A. Reyes, and R. Goonesekere (2019), “On Experimental Periodic Motions in a Duffing Oscillatory Circuit”, *Journal of Vibration Testing and System Dynamics*, Vol 3 (2019), Issue 1, pp 55-69.
4. **Y. Guo** and A.C.J. Luo (2017), “Complete Bifurcation Trees of a Parametrically Driven Pendulum”, *Journal of Vibration Testing and System Dynamics*, Vol 1 (2017), Issue 2, pp.93-134.
5. A.C.J. Luo and **Y. Guo** (2016), “Periodic motions to chaos in pendulum”, *International Journal of Bifurcation and Chaos*, Vol 26, No. 9 (2016), 1650159.
6. **Y. Guo** and A.C.J. Luo (2017), “Routes of Periodic Motions to Chaos in a Periodically Forced Pendulum”, *International Journal of Dynamics and Control*, Vol 5, Issue 3, pp. 551-569.
7. **Y. Guo** and A.C.J. Luo (2015), “On complex periodic motions and bifurcations in a periodically forced, damped, hardening Duffing oscillator”, *Chaos, Solitons and Fractals*, Vol 81 (2015), pp. 378-399.

8. S. Wang and **Y. Guo** (2015), “On causality of manufacturing processes with significant time delays”, *TAPPI Journal*, Vol 14 (11), pp. 725-738.
9. **Y. Guo** and A.C.J. Luo (2015), “Periodic motions in a double-well Duffing oscillator under periodic excitation through discrete implicit mappings”, *International Journal of Dynamics and Control*, Vol 5 (2), pp. 223-238.
10. A.C.J. Luo and **Y. Guo** (2015), “A semi-analytical prediction of periodic motion in Duffing oscillator through mapping structures”, *Journal of Discontinuity, Nonlinearity, and Complexity*, Vol 4 (2015), Issue 2, pp. 121-150.
11. **Y. Guo** and A. C.J. Luo (2011), “Parametric analysis of a periodically driven horizontal impact pair”, *International Journal of Bifurcation and Chaos*, Vol 7, Issue 2, Article No. 021001.
12. **Y. Guo** and A. C.J. Luo (2011), “Analytical prediction of complex motions of a ball in a periodically shaken horizontal impact pair”, *ASME Journal of Computational and Nonlinear Dynamics*, Vol 7, Issue 2, Article No. 021001.
13. A.C.J. Luo and **Y. Guo** (2010), “Parameter Characteristics for Stable and Unstable Solutions in Nonlinear Discrete Dynamical Systems”, *International Journal of Bifurcation and Chaos*, Vol 20, Issue 10, pp. 3173-3191.
14. **Y. Guo** and A. C.J. Luo (2011), “Discontinuity and Bifurcation Analysis of Motions in a Fermi Oscillator under Dual Excitations”, *Journal of Vibroengineering*, Vol 13, Issue 1, pp. 66-101.
15. A.C.J. Luo and **Y. Guo** (2010), “Switching Mechanism and Complex Motions in an Extended Fermi-Acceleration Oscillator”, *ASME Journal of Computational and Nonlinear Dynamics*. Vol 5, Issue 4, pp. 1-14.
16. A.C.J. Luo and **Y. Guo** (2009), “Motion Switching and Chaos of a Particle in a Generalized Fermi-Acceleration Oscillator”, *Mathematical Problems in Engineering*, Paper No. 298906.

#### Conference Articles:

1. **Y. Guo**, and A.C.J. Luo, (2022), “Period-3 and Period-6 Motions in a Nonlinear Spring Pendulum”, Proceedings of the ASME 2022 International Mechanical Engineering Congress & Exposition, Columbus, OH, USA, Paper No. IMECE2022-96427.
2. **Y. Guo**, and A.C.J. Luo, (2020), “Periodic Motions and Bifurcations of a Periodically Forced Spring Pendulum”, Proceedings of the ASME 2020 International Mechanical Engineering Congress & Exposition, Portland, Oregon, USA, Paper No. IMECE2020-23384.
3. **Y. Guo**, and A.C.J. Luo, (2019), “Period-1 Motions to Chaos with Varying Excitation Frequency in a Parametrically Driven Pendulum”, Proceedings of the ASME 2019 International Mechanical Engineering Congress & Exposition, Salt Lake City, UT, USA, Paper No. IMECE2019-10772.
4. **Y. Guo**, and A.C.J. Luo, (2019), “Complete Bifurcation Trees of Independent Period-2 Motions to Chaos in a Parametrically Excited Pendulum”, Proceedings of the ASME 2019 International Design Engineering Technical Conference & Computers and Information in Engineering Conference, Anaheim, CA, USA, Paper No. IDETC2019-97260.
5. **Y. Guo**, A.C.J. Luo, Z. Reyes, and A. Reyes, (2018), “Asymmetric Motions in a Duffing Oscillatory Circuit”, Proceedings of the ASME 2018 International Mechanical Engineering Congress & Exposition, Pittsburgh, PA, USA, Paper No. IMECE2018-86833.
6. R. Goonesekere and **Y. Guo**, (2018), “Unmanned Underwater Drone Design for Ocean Exploration”, Proceedings of the ASME 2018 International Mechanical Engineering Congress & Exposition, Pittsburgh, PA, USA, Paper No. IMECE2018-87649.

7. **Y. Guo** and A.C.J. Luo, (2017), "Period-1 Motions to Chaos in a Parametrically Excited Pendulum", Proceedings of the ASME 2017 International Mechanical Engineering Congress & Exposition, Tampa, FL, USA, Paper No. IMECE2017-70775.
8. **Y. Guo** and A.C.J. Luo, (2017), "Bifurcation Trees of a Parametrically Excited Pendulum", Proceedings of the ASME 2017 International Design Engineering Technical Conference & Computers and Information in Engineering Conference, Cleveland, OH, USA, Paper No. IDETC2017-67161.
9. **Y. Guo** and A.C.J. Luo, (2016), "Periodic Motions to Chaos in a Periodically Excited Pendulum", Proceedings of the 6<sup>th</sup> International Conference on Nonlinear Science and Complexity, INPE, Sao Jose dos Campos, SP, Brazil.
10. **Y. Guo** and A.C.J. Luo, (2016), "Bifurcation Tree of Period-1 Motion to Chaos in A Pendulum with Periodic Excitation", Proceedings of the ASME 2016 International Design Engineering Technical Conference & Computers and Information in Engineering Conference, Charlotte, NC, USA, Paper No. IDETC2016-59331.
11. **Y. Guo** and A.C.J. Luo, (2016), "Analytical Bifurcation Trees of a Periodically Excited Pendulum", Proceedings of the ASME 2016 International Mechanical Engineering Congress & Exposition, Phoenix, AZ, USA, Paper No. IMECE2016-65916.
12. **Y. Guo** and A.C.J. Luo, (2015), "Bifurcation Trees of Peirod-1 to Chaos in A Periodically Forced, Damped, Hardening Duffing Oscillator", Proceedings of the ASME 2015 International Mechanical Engineering Congress & Exposition, Houston, USA, Paper No. IMECE2015-50027.
13. **Y. Guo** and A.C.J. Luo, (2015), "Bifurcation Trees of Period-1 Motion to Chaos in a Duffing Oscillator with Double-Well Potential", Proceedings of the ASME 2015 International Design Engineering Technical Conference & Computers and Information in Engineering Conference, Boston, USA, Paper No. IDETC2015-48104.
14. **Y. Guo** and A.C.J. Luo, (2012), "Analytical Dynamics of a Ball Bouncing on a Vibrating Table", Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Houston, Texas, USA, Paper No. IMECE2012-86075.
15. A.C.J. Luo and **Y. Guo**, (2011), "Bifurcation Analysis of a Double-Excited Fermi-Acceleration Oscillator under Different Excitations", Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Denver, Colorado, USA, Paper No. IMECE2011-62947.
16. **Y. Guo** and A.C.J. Luo, (2011), "Complex Motions in a Horizontal Impact Pair with Periodic Excitation", Proceedings of the ASME International Design Engineering Technical Conference & Computers and Information in Engineering Conference, Washington, DC, USA, Paper No. IDETC/CIE2011-47385.
17. A.C.J. Luo and **Y. Guo**, (2010), "Switchability and Bifurcation of Motions in a Double-Excited Fermi-Acceleration Oscillator", Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Vancouver, British Columbia, Canada, Paper No. IMECE2010-39165.
18. A.C.J. Luo and **Y. Guo**, (2009), "On Stable and Unstable Periodic Solutions of N-Dimensional Discrete Dynamical Systems", Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Florida, MA, USA, Proceedings 10 (PART B), pp. 945-953.
19. A.C.J. Luo and **Y. Guo**, (2008), "Switching Bifurcation and Chaos in an Extended Fermi-Acceleration Oscillator", Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Boston, MA, USA, Proceedings 11, pp. (Vol 2) 293-304.

### **Professional Presentation:**

1. Invited Talk, “Discrete Implicit Maps for Predicting Periodic Motions”, International Conference on Nonlinear Science and Complexity, Istanbul, Turkey, 2023.
2. Invited Talk, “Nonlinear Dynamics in a Duffing Oscillatory Circuit”, the 2022 Online Conference on Nonlinear Science and Complexity, Thessaloniki, Greece, 2022.
3. “Period-3 Motions in a Periodically Forced Spring Pendulum”, the 1<sup>st</sup> Online Conference on Nonlinear Dynamics and Complexity, 2020.
4. “Analytical Bifurcations Trees of a Parametrically Excited Pendulum”, the 4th Annual Meeting of SIAM Central States Section, University of Oklahoma, Norman, OK, 2018.
5. “Bifurcation Trees of a Pendulum with Periodic Excitation”, Invited Lecture, SAA International Seminar, Shanghai Jiao Tong University, Shanghai, China, 2018.
6. “Period-2 Motions to Chaos in a Parametrically Excited Pendulum”, Poster, 7<sup>th</sup> International Conference on Nonlinear Science and Complexity, San Luis Potosi, Mexico, 2018.
7. “Bifurcation Tree of a Duffing Oscillator using Discrete Mappings”, Keynote Speech, the 9<sup>th</sup> International Conference on Differential Equations and Dynamical Systems, Dallas, USA, 2015.
8. “Analytical Prediction of Periodic Solutions in Duffing Oscillator using Discretization”, Midwestern State University Faculty Forum, 2015.
9. “Analytical Prediction of Periodic Motions in Duffing Oscillator”, 2014 International Conference on Nonlinear Science and Complexity, Xi’an, China, 2014.
10. “Analytical Prediction of Periodic Solutions in Duffing Oscillator through Mapping Structure”, ASME 2014 International Design & Engineering Technical Conferences, Buffalo, NY, USA, 2014.
11. “Analytical Solution of Duffing Oscillator”, 5<sup>th</sup> Annual Scholarship Colloquium, Midwestern State University, 2014.
12. “Switching Mechanism of Periodic and Chaotic Motions in an Extended Fermi-acceleration Oscillator”, Presentation on 8<sup>th</sup> Understanding Complex Systems Conference at University of Illinois Urbana Champaign, 2008.
13. “Switching Bifurcation and Chaos in an Extended Fermi-Acceleration Oscillator”, Presentation on 12<sup>th</sup> Conference on Nonlinear Vibrations, Dynamics and Multibody Systems at Virginia Tech, 2008.
14. “Switching and Stick Motions in an Extended Fermi-Acceleration Oscillator”, Presentation on International symposium on Dynamics of Vibro-Impact Systems, Troy Michigan, USA, 2008.

### **Thesis and Dissertation:**

1. **Yu Guo** (2008), “Motion Switching Catastrophe and Chaos of a Particle in an Extended Fermi-Acceleration Oscillator”, *Thesis, Master of Science Degree*.
2. **Yu Guo** (2013), “Bifurcation and Chaos of Nonlinear Vibro-Impact Systems”, *Dissertation, Doctor of Philosophy in Engineering Science Degree*.

### **REVIEW ACTIVITIES**

- Reviewer of conference, The International Conference on Nonlinear Dynamics and Complexity since 2012.

- Reviewer of conference, ASME International Mechanical Engineering Congress and Exposition, since 2014.
- Reviewer of conference, ASME International Design Engineering Technical Conference & Computers and Information in Engineering Conference, since 2015.
- Reviewer of journal, Electronic Journal of Qualitative Theory of Differential Equations since 2012.
- Reviewer of journal, Communications in Nonlinear Science and Numerical Simulation since 2014.
- Reviewer of journal, Chaos, Solitons & Fractals since 2014.
- Reviewer of journal, Journal of Applied Nonlinear Dynamics since 2015.
- Reviewer of journal, Journal of Vibration and Control since 2015.
- Reviewer of journal, Discontinuity, Nonlinearity, and Complexity since 2015.
- Reviewer of journal, Nonlinear Dynamics since 2015.
- Reviewer of journal, Journal of Taibah University for Science since 2015.
- Reviewer of journal, International Journal of Bifurcation and Chaos since 2016.
- Reviewer of journal, Modern Physics Letters B since 2016.
- Reviewer of journal, Vibration Testing and System Dynamics since 2017.
- Reviewer of Computer Modeling in Engineering & Sciences since 2018.
- Reviewer of European Physical Journal ST since 2018.

## **SERVICE ACTIVITIES**

- Served in engineering day to present SolidWorks simulation and organize activities for high school students visiting the department, 2013-2018.
- Recruiting student at Coppell high school in Dallas, and in Wichita Falls College Night, 2013.
- Mentor for the ASME HAV competition team, 2013-2014.
- Faculty Advisor of East Asian Student Association, 2013-2018.
- Served as Web Master for McCoy School of Engineering, 2013-present.
- Lead on Internship Survey of McCoy School of Engineering, 2013-2018.
- Judge of TCEA Area 9 Robotics Competition, spring 2014, spring 2015, spring 2016, spring 2017, spring 2019, spring 2020, spring 2022, spring 2023.
- Judge of Beal Bank Dallas Regional Science and Engineering Fair, 2014, 2015, 2016, 2017, 2019, 2022.
- Evaluator for the Undergraduate Research and Creative Activity Forum, Since 2014.
- Served in Spirit day and Transfer day, Summer 2014.
- Served in Mustangs Rally, since 2014.
- Mentor of undergraduate student on engineering competition “Hack the North”, University of Waterloo, Canada, 2014.
- Mentor of undergraduate research project in UGROW, Summer 2014, Summer 2015, Summer 2016, summer 2017, summer 2018, summer 2019.
- Mentor of multiple undergraduate research projects in EURECA, since 2014. Multiple awards received.

- Participated in “Midwestern State University Young Engineer Summer Camp”, Summer 2014, Summer 2015, summer 2016, summer 2017, summer 2018, summer 2019, summer 2021, summer 2022.
- Co-Director of “Midwestern State University Young Engineer Summer Camp”, Summer 2014, Summer 2015, summer 2016, summer 2017, summer 2018, summer 2019.
- Member of Organizing Committee of 2015 International Conference on Nonlinear Science and Complexity, La Manga, Spain.
- Served as Session Organizer of ASME 2017 International Mechanical Engineering Congress & Exposition, Tampa, FL, USA, 2017.
- Associate Editor of Journal of Vibration Testing and System Dynamics, since 2017.
- Served as Library Committee at MSU, 2017 – 2019.
- Served as Information Technology Advisory Committee at MSU, 2018 – 2020.
- Served as symposium organizer of the 4th Annual Meeting of SIAM Central States Section, University of Oklahoma, Norman, OK, 2018.
- Served as symposium organizer of the 5th Annual Meeting of SIAM Central States Section conference, Iowa State University, 2019
- Served as MCOSME research committee at MSU, 2019 – 2020
- Served as Session Organizer of ASME 2019 International Design Engineering Technical Conferences, Anaheim, CA, USA, 2019.
- Served as Session Organizer of ASME 2019 International Mechanical Engineering Congress & Exposition, Salt Lake City, UT, USA, 2019.
- Served as Session Organizer of ASME 2020 International Mechanical Engineering Congress & Exposition, Portland, Oregon, USA, 2020.
- Served as Organizing Committee member and Symposium Organizer of the 1st Online Conference on Nonlinear Dynamics and Complexity, 2020.
- Served as Session Organizer of ASME 2021 International Mechanical Engineering Congress & Exposition, USA, 2021.
- Served as Scientific Committee member and Symposium Organizer of the 2nd Online Conference on Nonlinear Dynamics and Complexity, 2021.
- Served as Scientific Committee member of the 2022 Conference on Nonlinear Dynamics and Complexity, Thessaloniki, Greece, 2022.
- Served as Session Organizer of ASME 2022 International Mechanical Engineering Congress & Exposition, USA, 2022.
- Served as Scientific Committee member of the 2023 Conference on Nonlinear Dynamics and Complexity, Istanbul, Turkey, 2023.
- Served as Session Organizer of ASME 2023 International Mechanical Engineering Congress & Exposition, USA, 2023.

## **PROFESSIONAL DEVELOPMENT ACTIVITIES**

- ABET Faculty Workshop, 2013.
- Internal Faculty Award “Computational Analytical Solutions of Nonlinear Oscillators”, 2013- 2014, 2014-2015, 2015-2016.
- Internal Faculty Award “Texture and Shape Recognition Using 2-D Robot Vision”, 2013-2014.
- Invited to one of the four Faculty Forum presentations of Midwestern State University for academic year 2014-2015.
- ANSYS training “Introduction to ANSYS FLUENT”, March 17th-21st, 2014
- PLC training on CompactLogix 5000 series, 2015

- ANSYS training “Introduction to ANSYS Mechanical for Oil and Gas Users”, August 10th-14th, 2015
- Kawasaki robot 5 day training at Detroit, August 2017.
- Received 12 Professional development hours at the 2021 ABET symposium, April 14th-16th, 2021.
- Received 12 Professional development hours at the 2022 ABET symposium, April 11th-13th, 2022.