**Wave Propagation and Information Transport in Disordered Heterogeneous Media; May 13-15, 2020 – Boulder, CO**

***Workshop Website*** <https://www.colorado.edu/event/wdm2020>

**Proposed talk title:**

**More Optimal Fractional Order Damping: A Tutorial**

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**Abstract: This tutorial lecture will introduce fractional order damping where the derivative is of non-integer order. Fractional order calculus will be introduced briefly first. Using a simple modeling problem, we will demonstrate that the fractional order model can perform better than the best integer order model under fair comparison. Numerical inverse Laplace method is introduced to solve the optimal model fitting problems with MATLAB codes given. Then we will see how to introduce the fractional derivative in the damping term in a generic mass-spring-damper example. Again we will show the better than the best performance can be achieved. We will generalize the idea to distributed order or even complex order case. Finally, I advocate that, fractional order control strategies could bring in additional benefit in engineering practice.**

**About the speaker:** **YangQuan Chen**earned his Ph.D. from [Nanyang Technological University](http://www.ntu.edu.sg/eee/), Singapore, in 1998. He had been a faculty of Electrical Engineering at Utah State University from 2000-12. He joined the School of Engineering, University of California, Merced in summer 2012 teaching “Mechatronics”, “Engineering Service Learning” and “Unmanned Aerial Systems” for undergraduates; “Fractional Order Mechanics”, “Linear Multivariable Control”, “Nonlinear Controls” and “Advanced Controls: Optimality and Robustness” for graduates. His research interests include mechatronics for sustainability, cognitive process control, small multi-UAV based cooperative multi-spectral “personal remote sensing”, applied fractional calculus in controls, modeling and complex signal processing; distributed measurement and control of distributed parameter systems with mobile actuator and sensor networks.

Dr. Chen served as a Co-Chair for IEEE Robotics and Automation Society Technical Committee (TC) on Unmanned Aerial Vehicle and Aerial Robotics (12-18). He recently served the TC Chair for the ASME DED Mechatronics Embedded Systems Applications (2009-10); Associated Editor (AE) for IEEE Trans. on Control Systems Technology (00-16), ISA Trans. (12-17), IFAC Control Engineering Practice (12-17), IET Control Theory and Applications (15-18), and Journal of Dynamics Systems, Measurements and Control (09-15). He now serves as Topic Editor-in-Chief of International Journal of Advanced Robotic Systems (Field Robotics), Section AE (Remote Sensors) for Sensors, Senior Editor for International Journal of Intelligent Robotic Systems, Topical AE for Nonlinear Dynamics (18-) and AE for IFAC Mechatronics, Intelligent Service Robotics; and Fractional Calculus and Applied Analysis. He is a member of IEEE, ASME, AIAA, ASPRS, AUVSI and AMA. He relies on Google citation page to keep track of his publications at <https://scholar.google.com/citations?user=RDEIRbcAAAAJ>

Dr. Chen started some new investigations, published some papers and books, graduated some students, hosted some visiting scholars and also received some awards including the IFAC World Congress Best Journal Paper Award (Control Engineering Practice, 2011), First Place Awards for 2009 and 2011 AUVSI SUAS competitions, and most importantly, the “Relationship Counselor” award from IEEE Utah State University Student Branch for “explaining human relationship using control theory.” He is a member of IEEE, ASME, AIAA, ASPRS, AUVSI and AMA. He is listed in Highly Cited Researchers by Clarivate Analytics in 2018 and 2019.

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