

College of EngineeringTM

Fractional Order Calculus Day at Utah State University

(FOC Day @ USU, [April 19, 2005](#))

Organized by

Center for Self-Organizing and Intelligent Systems (CSOIS),
Department of Electrical and Computer Engineering
Utah State University

- **What is FOC:** Fractional order calculus (FOC) is about the differentiation and integration of non-integer orders. For example, $\frac{d^{0.5}}{dt^{0.5}} f(t)$ is the so-called “semi-differentiation.” For more information, check <http://mechatronics.ece.usu.edu/foc/> and <http://www.tuke.sk/podlubny/fc.html>
- **What in the day:** Experts from both academia and industry will share their views (achievements vs. current research issues) on FOC. Professors and graduates from within the USU campus to share their problems at hand with possible link to FOC. Round table discussions.
- **Where:** EL206 (CSOIS White Room)
- **When:** 9:00AM-1:00PM (introductory talks); 2:00PM-5:00 PM (research talk by Prof. Igor Podlubny and round table discussions). [April 19, 2005 \(Tuesday\)](#)
- **Who should attend:** **All** are welcome.
- **Organizer:** Prof. YangQuan Chen, Acting Director of CSOIS. Contacts:
 - T: (435)797-0148; F: (435)797-3054; E: yqchen@ece.usu.edu; W: <http://www.csois.usu.edu/people/yqchen/>
- **International Visitor¹:** Prof. Igor Podlubny, Tech. Univ. of Kosice, Slovakia
- **Industry Visitor:** Dr. Gary Bohannon, Wavelength Electronics, Montana

¹ Prof. Igor Podlubny’s visit was sponsored by National Research Council, Twinning Program. Senior Program Manager: Kelly Robbins (KRobbins@nas.edu)

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Schedule (FOC Day @ USU, April 19, 2005)

- **9:00-9:30: YangQuan Chen.** Kick-off introduction. Introduction to two distinguished visitors (Professor Igor Podlubny from Tech. Univ. of Kosice, Slovak and Dr. Gary Bohannan, Wavelength Electronics, Montana. @EL206
- **9:30-10:30. FOC research in the CSOIS, USU @EL206**
 - **Dr. Jinsong Liang.** (20min.)
 - FO wave-diffusion equation FO boundary control with boundary measurement delay, robustness issue (ASME DETC05)
 - Temporal and spatial fractional order wave-diffusion equation and FO boundary control
 - **Mr. Hyosung Ahn,** Ph.D. candidate (20 min.)
 - Robust controllability of FO LTI interval systems (ASME FDTA05)
 - FO LTI interval system stability check (ICMA05, www.icma2005.org)
 - **Mr. Zhongmin Wang,** Ph.D. candidate (10 min.)
 - FO potential field in MAS-net (mobile actuator and sensor networks), and/or in a modified CVT (centroidal Voronoi tessellation)
 - **Ms. Tripti Bhaskaran,** MSc. Plan-A (10 min.)
 - FO PI/PID, considerations and progress
- **10:30-11:10 Soil Physics (Prof. Scott Jones's Group, Dept. of Plants, Soils & Biometeorology)**
 - **Dr. Scott Jones.** (20 min.) @EL206
 - Electromagnetic Sensing Systems in Environmental Sciences: Needs and Applications.
 - **Mr. Hiruy Abdu** (20 min.) @EL206
 - Waveform Analysis of Open-Ended Coaxial Time Domain Reflectometry Probes.
- **11:10-11:30 Electrochemical Biosensors (Prof. Anhong Zhou's Group, Dept. of Biological & Irrigation Engineering)**
 - **Drs. Anhong Zhou and YangQuan Chen.** (20 min.) @EL206
 - Fractional order signal processing in biology/biomedical signal analysis (ARFIMA, R/S Hurst, FD, etc.) e.g. "Detection of DNA hybridization on gold coated QCM surface"
- **11:30-11:50 Soil Dynamics. Prof. James A. Bay's Group.**
 - **Ms. Inthuorn Sasankul** (20 min.) @EL206
- **12:00-13:00 Gary Bohannan.** @Engr203 "Introducing a New Class of Electronic Circuit Element: the Fractor" Invited Lecture for ECE6800 Electrical Engineering Colloquium
<http://www.engineering.usu.edu/classes/ece/6800/>
- **13:00-14:00. Box lunch break for speakers @EL206**
- **14:00-15:00. Dr. Igor Podlubny (Technical University of Kosice, Slovakia)**
 - Physical and geometrical interpretations of fractional order integration and differentiation
 - Physical interpretation of the initial conditions in terms of fractional order derivatives
 - Fractional differential operators and their adjoints.
- **15:00-17:00. Round table discussions. Moderated by Dr. YangQuan Chen.** @EL206
 - FOC related events: **2005** – ASME 2nd Symposium on Fractional Derivatives & Their Applications (ASME DETC FDTA05, organizers: Profs. Om Prakash Agrawal, Jocelyn Sabatier and J. A. Tenreiro Machado); **2006** – the 2nd IFAC FDA06: Workshop on Fractional Differentiation & its Applications (<http://www.gecad.isep.ipp.pt/FDA06/>; Chair: Stefan Samko and co-Chair: Blas M. Vinagre)
 - NSF Partnership grant proposal (leading PI: Prof. Om Prakash Agrawal)
 - Research directions, IP issues, industry interests