

Dynamic Systems Control Laboratory

University of Michigan-Shanghai Jiao Tong University Joint Institute

• About the Lab •

Our focus is to develop strategies for the control of various dynamic systems such as multi-mass system, inverted pendulum, electric vehicle, networked hybrid energy system, wireless power transfer system. The research include a strong "mechatronics" element, i.e., synergistic integration of physical systems, control theory, sensing and actuation devices, which make possible the generation of simpler, smarter, more economical and reliable systems.

Web: <http://umji.sjtu.edu.cn/lab/dsc/>

• About the Team •

Chengbin Ma, Ph.D.,

Assistant Professor, Director of Dynamic Systems Control (DSC) Laboratory

University of Michigan-Shanghai Jiao Tong University Joint Institute

Research Interests: energy management and control, wireless power transfer, electric vehicle, motion control and mechatronics.

Academic and Industrial Backgrounds:

Tenure-Track Assistant Professor of electrical and computer engineering with the University of Michigan–Shanghai Jiao Tong University Joint Institute (UM-SJTU Joint Institute), Shanghai Jiao Tong University, Shanghai, China, Aug. 2008-present Postdoctoral Researcher with IMS-Mechatronics Laboratory, the Department of Mechanical and Aeronautical Engineering, University of California, Davis, USA, Nov. 2006-Mar. 2008. R&D Researcher with Servo Laboratory, FANUC Ltd., Oshino-mura, Yamanashi Prefecture, Japan, Oct. 2004-Oct. 2006.

Ph.D. degree in electrical engineering from Hori Laboratory, the Department of Electrical Engineering, The University of Tokyo, Tokyo, Japan, Oct. 2001-Sep. 2004.

Adviser: Professor Yoichi Hori

Thesis: Fractional Order Control and Its Applications in Motion Control

Master degree in electrical engineering from Yamaji-Fujii Laboratory, the Department of Electrical Engineering, the University of Tokyo, Tokyo, Japan, Oct. 2009-Sep. 2004.

B.S.E.E. degree with honor from the Department of Industrial Automation, East China University of Science and Technology, Shanghai, China, Sep. 1993-Jul.1997.

• Research Fields •

● **Motion/Motor Control**

Resonance vibration suppression through nominal characteristic ratio assignment;
Generalized time constant assignment for non-all-pole systems;
Optimized determination of characteristic ratios for high-order systems;
Extension of polynomial method into the control of multi-input-multi-output systems Project.

● **Electric Vehicle Dynamics**

Single-parameter skidding detection and control of electric vehicles based on the ratio of wheel rotary acceleration to drive motor torque;
Simulink model of the dynamics of Rear-wheel-drive electric vehicles using in-wheel motors;
Envelope control of electric vehicle using electric motors as sensors.

● **Hybrid Energy System**

Dynamic battery model for use in electric vehicle simulations;
Quantitative evaluation of battery-ultracapacitor hybrid energy system;
Battery ageing test and analysis by the hybrid with ultracapacitors;
Multi-agent-based modeling of hybrid energy systems;

Distributed control of hybrid energy system using game theory.

- **Wireless Power Transfer**

A system-level design, modeling and feedback control for high efficiency WPT systems;

Analysis and tracking of optimal load in single- and multi-receiver WPT systems;

Optimal power distribution among multiple WPT systems;

ON-OFF control of power amplifier for charging at various power levels.

• **Responsibility** •

Participate in modeling, control system design/implementation, analysis, and writing papers and reports.

• **Eligibility** •

- In principle, we recruit junior and senior students
- Hold at least a 2.5 GPA on a 4.0 scale
- Students of non-English speaking countries must provide English language proficiency certificate, IELTS no less than 6.0, and TOEFL no less than 90 points. If you are in the college for English teaching programs, please provide relevant certificates
- Have at least one prior research experience
- ECE and ME students with backgrounds in dynamic modeling and control, circuits, power electronics, etc.

• **Additional Financial Support** •

N/A

• **Contact** •

Chengbin Ma, Ph.D., Assistant Professor

Director of Dynamic Systems Control (DSC) Laboratory

University of Michigan-Shanghai Jiao Tong University Joint Institute

800 Dongchuan Road, Minhang District, Shanghai 200240, P. R. China

Email: chbma@sjtu.edu.cn

Phone: +86-21-3420-6209 (office)

Fax: +86-21-3420-6525 (UM-SJTU Joint Institute)

Web: <http://umji.sjtu.edu.cn/faculty/chengbin-ma/>