Zheren Ma

The University of Texas at Austin
Dynamic Systems and Control, Mechanical Engineering
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EDUCATION

The University of Texas at Austin *2013-present*
Ph.D. student, Mechanical Engineering, GPA: 4.0/4.0
Advisor: Dongmei Chen

Shanghai Jiao Tong University, China *2009-2013*
B.S., Mechanical Engineering, GPA: 91.07/100

SKILLS

- Programming Languages: Matlab/Simulink, C++, Python, Java, VB
- Commercial Softwares: Unigraphics, AutoCAD, Microsoft Power BI, DeltaV
- Other skills: System modeling and control, Computational fluid dynamics, Finite difference/volume analysis, Signal processing, Time series analysis and prediction

INTERN EXPERIENCE

Emerson DeltaV Process Control Intern Summer 2015
- Developed VBA code for automating data analysis and report generation.
- Conducted power spectrum analysis for identifying interacting control loops.
- Created cloud-based dynamic reports using Microsoft Power BI.

Singapore Technologies Scholarship Intern Summer 2012
- Developed an adaptive Pure Pursuit guidance law for automated guided vehicle (AGV).

SELECTED PROJECTS

Multi-Phase Gas Kick Modeling and Automation 9/2015-present
- Proposed a novel multi-phase flow modeling methodology that can be deployed in combination with suitable hydraulic models for managed pressure drilling (MPD) well control.
- Developed a software package for gas kick simulation that can handle many complexities which occur during a MPD well control incident such as handling multiple kicks from one or several formations, dynamic well control, automated choke control, sudden pump start up/shut off, non-Newtonian drilling fluids, arbitrary wellbore path (including directional and horizontal wells), area discontinuity, etc.

Modeling and Simulation of Vibrations in a Drilling System 2/2015-5/2015
- Modeled drill string by using a distributed drill pipe model and a comprehensive rock-bit interaction model.
- Conducted vibration analysis including bit-bounce, stick-slip and bit whirl.

Control of a Wind Turbine and Battery Hybrid System 6/2014-11/2014
- Developed an efficient and reliable power scheduling approach that applied model predictive control (MPC) to probabilistic wind speed forecast.
- Proposed a real-time active power controller that enhances power reference tracking and optimizes the performances of hybrid system under instantaneously varying wind speed.

Wind Turbine Control During Partial Load Operation 9/2013-5/2014
- Designed a dynamic-programming-based controller and improved wind energy capture compared to the baseline control under fluctuating wind profiles.
- Proposed an adaptive generator torque controller that improved turbine performances in terms of wind energy harvesting and fatigue loading mitigation, and better robustness against model uncertainties.
- Developed a wind turbine simulator for controller validation and fatigue analysis.

TEACHING/ RESEARCH EXPERIENCE

- Graduate Research Assistant in Petroleum Engineering 9/2015-present
- Graduate Research Assistant in Mechanical Engineering 1/2015-5/2015
- Teaching Assistant of Engineering Computational Methods 9/2013-12/2014

PUBLICATIONS

Journal Papers

- Zheren Ma, Zeyu Yan, Mohamed L. Shaltout, Dongmei Chen
  Optimal real-time control of wind turbine during partial load operation
  IEEE Transactions on Control Systems Technology, vol. 23, no. 6, pp. 2216-2226, 2015.
- Zheren Ma, Mohamed L. Shaltout, Dongmei Chen
  An Adaptive Wind Turbine Controller Considering Both the System Performance and Fatigue Loading
  Journal of Dynamic Systems, Measurement, and Control, vol. 137, no. 11, p. 111007, 2015.
- Liang Gong, Yan Xi, Zheren Ma, Chengliang Liu
  Modeling, identification and simulation of DC resistance spot welding process for aluminum alloy 5182
  Journal of Shanghai Jiaotong University, vol. 18, no. 1, pp. 101-104, 2013.
- Zheren Ma, Mohamed L. Shaltout, Dongmei Chen
  Optimal power dispatch and control of an integrated wind turbine and battery system accepted, *IEEE Transactions on Control Systems Technology*.

Conference Papers

- Zheren Ma, Dongmei Chen
  Modeling of coupled axial and torsional motion of a drilling system
  ASME Dynamic Systems and Control Conference, pp. V002T20A005, 2015.
- Zheren Ma, Dongmei Chen
  Optimal power dispatch and control of a wind turbine and battery hybrid system
  American Control Conference, pp. 3052-3057, 2015.
- Zheren Ma, Mohamed L. Shaltout, Dongmei Chen
  Adaptive gain modified optimal torque controller for wind turbine partial load operation
  ASME Dynamic Systems and Control Conference, pp. V002T18A002, 2014.
- Zheren Ma, Liang Gong, Yanming Li, Chengliang Liu
  CMAC-based real-time calculation of the effective welding current during AC resistance spot welding
  IEEE International Conference on Mechatronics and Automation, pp. 1669-1674, 2013.
- Chengzhang Li, Zheren Ma, Lin Yao, Dingguo Zhang
  Improvements on EMG-based handwriting recognition with DTW algorithm
  International Conference of Engineering in Medicine and Biology Society, pp. 2144-2147, 2013.
- Zheren Ma, Brandon Li, Zeyu Yan
  Wearable driver drowsiness detection using electrooculography signal
  IEEE Radio Wireless Week, 2016.
- , Mohamed L. Shaltout, Zheren Ma, Dongmei Chen
  An economic model predictive control approach using convex optimization for wind turbines
  American Control Conference, 2016.

COURSEWORK

- Linear System Analysis
- Advanced Vehicle Powertrain System
- Modeling and Simulation of Multi-energy System
- Introduction to Modern Control
- Time-series Modeling/Analysis/Control
- Optimal Control Theory

- Computational Fluid Mechanics
- Multi-variable Control System
- Digital Signal Processing
- Digital Control
- Stochastic Systems and Control