Dr. Zhenyu Zhang
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WORK EXPERIENCE

Senior Staff Engineer Servo Firmware, WDC **06/2015 - present**

Responsibilities:

Analyzes, designs and implements high-performance embedded servo system for Data Center hard disk drives. Followings list some of delivered features.

- Designed and implemented control algorithm for load/unload velocity control, which significantly improves external disturbance rejection capability and enhances robustness against parameter uncertainties in servo system.

Staff Engineer Servo Firmware, WDC **09/2012 - 06/2015**

Responsibilities:

Analyzed, designed and implemented high-performance ARM-based embedded servo system for Enterprise/RE/Data Center hard disk drives. Job responsibility also involved failure analysis, troubleshooting, product support and integration. Followings list some of delivered features.

- Designed and implemented a new VCM coil temperature estimation model with high accuracy and adaptability to environment.
- Invented a unique servo burst demodulation method for HDD position sensing, which greatly improves SNR by introducing linear regression model into DFT method and enables diagnosis of servo burst defect as well.
- Invented a unique head-disk-interference detection system, which effectively detects HDI with high accuracy during drive processing by pattern recognition of HDI events.
- Designed a unique mode identification methodology to calibrate resonance modes for VCM/PZT. It enables accurate and reliable adaptive notch calibration during drive processing, thus improving drive performance in the field.
- Designed a unique decoupled methodology to adapt VCM/PZT gain via dual frequency based adaptation. This method enables minimally invasive real-time monitoring and compensation of VCM and PZT gain degradation, greatly improving drive performance and robustness.
- Invented a unique heuristic methodology to minimize the chances of hitting HTA during drive idling mode. This methodology provides a solution to a generic multivariable nonlinear optimization problem which achieves desirable tradeoff between optimality and execution time.

- Invented a unique, systematic and accurate methodology to detect and assess mechanical misalignment in HDD, which has become a very important factor to improve Data-Center product reliability.

RESEARCH EXPERIENCE

University of Connecticut **08/2009-08/2012**

NIH-funded project (NIH R24RR018934-01):

Control Design and Analysis for Rotationally Oscillating Drill (Ros-Drill©) with Low-Resolution Feedback

Graduate Research Assistant, ALARM Lab, Supervisor: Prof. Nejat Olgac

- Modeled, analyzed and simulated Ros-Drill© with low-resolution feedback.
- Designed a novel adaptive control logic for servo system with low-resolution feedback, achieving trajectory tracking with high fidelity.
- Analyzed the stochasticity of the servo system with low-resolution feedback and based on it, developed a novel adaptive control logic to make the system robust against stochasticity, system uncertainties and disturbances.
- Devised an effective method to achieve more accurate trajectory tracking of the servo system, reaching beyond the constraints of low-resolution feedback.
- Conducted research into application of advanced control theory to servo system with low-resolution feedback in the real-time control platform: Matlab/Simulink & Dspace.
- Designed and prototyped the embedded system for Ros-Drill© for the commercialization purpose, which includes mechatronic system design, advanced control logic design and implementation, circuit design, microcontroller programming (C/C++) and PCB design.

Beijing Jiaotong University, China **02/2008-06/2009**

Theoretical and Experimental Research on Ferrofluids Acceleration Sensor

Graduate Research Assistant

- Analyzed mechanism of ferrofluids acceleration sensor.
- Designed and prototyped ferrofluids acceleration sensor which include magnetic circuit design, circuit design, data acquisition and processing.

Beijing Jiaotong University, China **10/2008-03/2009**

Design of the Fatigue Machine

- Designed and implemented zero-phase control for an electro-hydraulic servo system.

SKILLSETS

Expertise: Servo motion control;
Adaptive control;
Machine learning (regression, classification, neural networks, Bayesians, clustering, dimensionality reduction, SVM, instance based, deep learning);
Digital signal processing;

Estimation and Kalman filtering;
System modeling, simulation and identification;
Real-time embedded system design.

Computers: Matlab/Simulink, Labview, C/C++, Python, AutoCAD, Protel99.

Language: Native in Chinese and Cantonese; Fluent in English.

PATENTS

- DATA STORAGE DEVICE DEMODULATING SERVO BURST BY COMPUTING SLOPE OF INTERMEDIATE INTEGRATION POINTS, pending (Submitted to USPTO by WDC in 2014).
- ELECTRONIC SYSTEM WITH MEDIA SCAN MECHANISM AND METHOD OF OPERATION THEREOF, pending (Submitted to USPTO by WDC in 2014) .
- HIGH-RESOLUTION, HIGH-THROUGHPUT, AND RELIABLE MEASUREMENT OF SPATIAL SEPARATION IN DISK DRIVES' RAMP TOUCH (Submitted to USPTO by WDC in 2015).

PUBLICATIONS

- Z. Zhang, Olgac, N, An Adaptive Control Method for Ros-Drill cellular Microinjector with Low-resolution Encoder, *Journal of Medical Engineering*, in press.
- Z. Zhang, Olgac, N, Adaptive Gain Scheduling for Rotationally Oscillating Drill (Ros-Drill), with Low-Resolution Feedback, *International Journal of Mechatronics and Manufacturing Systems*, in press.
- Z. Zhang, Olgac, N, Adaptive hybrid control for Rotationally Oscillating drill (Ros-Drill©), using a low-resolution sensor, In *Proceedings of the 2011 ASME Dynamic and System Control*, pp. 564-569.
- Z. Zhang, Olgac, N, An Adaptive Control Method with Low-Resolution Encoder, In *Proceedings of the 2013 ASME Dynamic and System Control*.

EDUCATION

Ph.D., University of Connecticut **08/2012**
Dept. of Mechanical Engineering **GPA:** 3.86/4.0
Major: Systems and Control **Advisor:** Dr. Nejat Olgac

M.S., Beijing Jiaotong University, China **05/2009**
Dept. of Mechanical Engineering **GPA:** 3.72/4.0
Major: Mechatronics

B.S., Beijing Jiaotong University, China **05/2007**
Mechanical Engineering & Automation **GPA:** 3.63/4.0