PAYAM MAHMOODI NIA, PhD

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MECHATROWARE DESIGN LEAD

Concept to Market Automation Expert

Lead systems and mechatronics design engineer with in-depth knowledge of complex dynamic systems design, robotics, and controls architecture design from concept to market. Proficiency in controls design for Linear Time-Invariant (LTI) time-delay dynamic systems. Experience with data science, statistics, machine learning, reinforcement learning, and deep learning algorithms in fault detection, calibration process, and qualification process automation.

Experience in stage mechanical design, dynamics analysis, linear modeling, sensor and actuator design and fusion, and controller design and system tuning for stability and performance requirements. Offer an in-depth understanding of project lifecycle and agile project development and management from concept to mass production.

Summary of Skills:

- **PROGRAMMING LANGUAGES:** Python, MATLAB, C++
- **ENGINEERING PACKAGES / APPLICATIONS:** MATLAB, Simulink and SimMechanics, SolidWorks, Ansys, Creo, JMP
- **PROJECT MANAGEMENT TOOLS:** TFS, Asana, Wrike, Microsoft Project
- **IDE:** Visual Studio, Jupyter Notebook, PyCharm

WORK EXPERIENCE

KLA, Milpitas, CA

Staff Mechatronics Design Engineer 2020 – 2023

- Designed mechatronics architecture of 6 axes wafer stages for future generation of FILM product line, passing 100% of positioning accuracy requirements and delivering stage to the field as promised.
- Led controller tuning design, enabling positioning accuracy; systematic tuning process was delivered to the field service team for future support readiness.
- Directed design for robustness against production and assembly process of stages, delivering quality control requirements to supplier, manufacturing, and engineering.
- Led and partially programmed automated qualification application for 6-axis wafer stage controller tuning, conveying project deliverables to management after final qualification tests on multiple stages proved an automated tuning could reduce tuning time from days to hours.
- Spearheaded multi-axial diagnostics tests for vibration and disturbance detection, satisfying isolation of different vibration sources defined in systems-level requirements.

CARL ZEISS X-RAY MICROSCOPY, Pleasanton, CA

Senior Systems Control Engineer 2017 – 2020

- Collaborated in designing multi-stage positioning controller architecture and tuning for X-ray imaging, delivering internal controller programs for synchronization, homing, fault detection, sensor / actuator signal tracing, and calibrations.
- Spearheaded fully automated python application overhaul to achieve X-ray source automated tuning for optimal beam centering and power management on optical targets in use on X-ray Microscopy Versa products, reducing days of X-ray source manual tuning into couple hours of automated calibration routines.
- Supported manufacturing, engineering, and global service teams for field escalations and customer support excellence.

ASML, Wilton, CT

Mechatronics Design Engineer 2014 – 2017

- Designed qualification tests on servo-controller tuning and loop shaping, meeting sub-nanometer positioning accuracy on reticle stages.
- Constructed and qualified sensor / actuator calibration and fault detection algorithms, which were used in future algorithms

for predictive maintenance and automated fault detection.

- Designed experiments to detect vibration sources, frequencies, and vibration transmission paths throughout systematic sensor placement tests and modal testing, discovering some of the major vibration sources and transmission paths to be considered for improvements on next generation stages.
- Created MATLAB GUI, qualifying nano-features on high resolution images using MATLAB image processing toolbox and frequency domain techniques.
- Designed experiments for system performance, reliability, and repeatability using Six Sigma tools.

NORTHEASTERN UNIVERSITY, Boston, MA

Research Assistant   2009 – 2014
- Supervised undergraduate students on dynamic systems analysis and linear systems control design methods. Conducted simulation, modeling, and experiments to design stable controllers for motors in teleoperation with multiple networks and sensor delays.
- Designed and applied robust controllers for LTI systems with measurable and unmeasurable time delays.
- Conducted studies to design stabilizing controllers for teleoperation of haptic manipulators with ambiguous delay in master-slave communication, testing a simple master-slave motor setup with communication delays.
- Designed, simulated, and implemented robust and optimal controllers for linear and non-linear systems, expanding knowledge in control for robotics and teleoperation design.
- Collaborated and presented design for handheld device to accommodate essential tremor with Harvard Medical School and Northeastern University research teams.
- Supervised project on human-machine interface for air traffic control missions, assisting in graphical interface design to test human-computer handshake goals using brain and skin signals; performed tests on human subjects.

EDUCATION

– **Doctor of Philosophy (PhD)**, Engineering, Northeastern University, Boston, MA
  - □ Mechanical Engineering with a minor in Electrical
  - □ Thesis: Control-Parameter-Space Classification for Delay-Independent Stability of LTI Time-Delay Systems
– **Master of Science (MSc)**, Mechanical Engineering, Ferdowsi University of Mashhad, Iran
  - □ Thesis: Kinematics, Kinetics and Workspace Analysis, Modeling and Simulation of Parallel Robotic Manipulators

TECHNICAL SKILLS

– Mechatronics, sensor fusion, systems calibration, and linear and nonlinear optimization
– Vibration control, time delay systems control, optimal control, robust control, model predictive control
– Robotics, kinematics, and dynamics analysis of complex multibody systems
– Signal processing, input shaping and disturbance handling
– Reinforcement Learning and Machine Learning and Deep Learning programing and architecture design through Convolution Neural Networks – Keras applications in Python

HONORS AND ACCOMPLISHMENTS

– Completed state-of-the-art project on "Automated multi-axis wafer stage control tuning to meet stage stability and performance specifications for navigation accuracy of FILM products" at KLA.
– Created automated multi-feature X-ray source calibration for Versa systems. Carl Zeiss X-Ray Microscopy, 2019.
– Won 1st place in ASML mechatronics robotics competition, ASML, 2014.
– Alfred J. Ferretti Award for Research Excellence in Mechanical Engineering Department, Northeastern University, 2014.
– Graduate Research Assistantship Award from Graduate School of Engineering, Northeastern University, 2010- 2014.

PUBLICATIONS

Over 20 publications in peer reviewed Journals and conferences. Full list of publications is available upon request.