HENG LIU

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EDUCATION

University of Missouri, Rolla Dec. 2013
M.S. in Manufacturing Engineering GPA: 3.75/4.0
Thesis: *Numerical Analysis of Thermal Stress and Deformation in Laser Metal Deposition Process*
Area of Study: Solid Mechanics, Computational Mechanics, Numerical Methods

Southwest Jiaotong University Jul. 2011
B.E. in Mechanical Engineering Rank: 1/368, GPA: 3.8/4.0

QUALIFICATIONS

CAE/CAD	Hypermesh, Simlab, ICEM, Abaqus, Ansys, Fluent, FEMFAT, nCode, CATIA
Programming	Python, MATLAB, Fortran, C
OS/Office	Windows, Linux, LaTeX, MS Office

PROFESSONAL EXPERIENCE

Ford Motor Company Mar. 2014 - Present
Duribility CAE Engineer *Livonia, MI*

· Conducted CAE durability analysis for powertrain components and assemblies with Abaqus to study the mechanical behaviors (stress, strain, displacement, compliance, contact pressure, thermal effects, sealing, etc.) of structures under certain loadings and boundary conditions.
· Performed CAE analysis for special cases like press-fit, bolt joints, fracture mechanics (J integral, K factors, etc), and bore distortion with proper model setting up to deliver accurate results.
· Performed fatigue analysis with FEMFAT to calculate damage, fatigue life, and safety factors using stress results from Abaqus and S-N curves (adjusted by considering the effects of mean stress, stress gradient, surface finish and statistical influences).
· Led the development of numerical tools (Python scripts, MATLAB scripts, Fortran subroutines, etc.) to speed up CAE pre/post-processing process, and provide efficient numerical algorithms to solve various optimization problems.
· Collaborated with component/system engineers to provide feasible design changes (topology, shape, size, etc.) and resolve test failures; collaborated with test engineers to correlate test results and CAE results.
· Reacted to launch issues, and performed quick analysis to identify root causes and provide solutions.

University of Missouri, Rolla Jan. 2012 - Dec. 2013
Graduate Research Assistant *Rolla, MO*

· Boeing and Rolls-Royce Research Project - TiAl6V4 Substrate Behavior Prediction and Validation
  - Performed thermal analysis to study the temperature fields of TiAl6V4 substrates during laser aided deposition process, and developed Fortran subroutines to account for thermal convection and radiation ('FILM') and motion of laser beam ('DFLUX').
  - Performed mechanical analysis to study the stress and distortion of the substrates, using the temperature fields generated from thermal analysis as inputs.
  - Conducted experiments to validate the temperature field with infrared camera and the deformation of substrate with laser displacement sensor.
  - Optimized the manufacturing process parameters (laser power, laser speed, and deposition pattern) using DOE method to minimize residual stress and distortion.

· NASA Research Project - Multiphysics and Multiscale Modeling of Additive Manufacturing Process
  - Developed FE models for heat transfer processes during additive manufacturing process with Abaqus.
  - Investigated the cooling rate of fused zone under different cooling conditions.

Southwest Jiaotong University Mar. 2011 - Jul. 2011
Undergraduate Research Assistant *Chengdu, Sichuan, China*

· Analyzed the structure principle and working characteristics of Continuously Variable Transmission (CVT) in Fendt Vario 900 series tractors; studied the hydraulic power diversion ratio using AMESim.
· Designed a special bed with proper control systems to secure users when earthquake occurs; created a simulation of the process with Ansys; fabricated and assembled the bed with team members.

ACADEMIC PROJECTS

Finite Element Analysis Curriculum Projects Sept. 2012 - May. 2013

· Investigated the stress distribution in a pressure vessel under thermal and mechanical loadings.
· Analyzed the frequency and mode shape of a water tower with solid and pipe cross sections.
· Studied the stress distribution in a thin-walled cylinder undergoing concentrated cutting force.

Applied Computational Methods Curriculum Projects Jan. 2013 - May. 2013

· Developed MATLAB/Python codes for numerical solutions of linear and nonlinear equations, numerical interpolation and polynomial approximation, gradient-based optimization, numerical differentiation and integration, and numerical solutions of ODEs

Six Sigma Curriculum Project - Hydraulic Leak Reduction Sept. 2012 - Dec. 2012

· Analyzed the variables that exist in the hydraulic assembly lines at John Deere which are not controlled or monitored; identified all the possible risks involved in the assembly operations using Process Failure Mode Effects Analysis (PFMEA) method.
· Developed a mistake proofing assembly method that would achieve robust process control by eliminating possibilities for the operators to bypass a defective subassembly.

PUBLICATIONS

· Wang, Z., Liu, R., Sparks, T., Liu, H., & Liou, F. W. (2014). **Stereo vision based hybrid manufacturing process for precision metal parts**. Precision Engineering.
· Liu, H., Sparks, T., Liou, F. W., & Dietrich, D. M. (2013). **Numerical Analysis of Thermal Stress and Deformation in Multi-Layer Laser Metal Deposition Processes**. Proceedings of Solid Freeform Fabrication Symposium, Austin, TX.
· Zhang, J., Liou, F. W., Fan, Z., Liu, H. (2013). **Probabilistic Simulation of Solidification Microstructure Evolution during Laser-Based Metal Deposition**. Proceedings of Solid Freeform Fabrication Symposium, Austin, TX.
· Liu, H., & Liu, T. (2011). **The Analysis of Fendt Vario 900 Tractor Transmission System**. Machine Tool & Hydraulics.

HONORS & ACTIVITIES

· Ford Motor Company – Transmission & Driveline Engineering Technical Achievement Award
· University of Missouri at Rollla – Secretary of Council of Graduate Students
· Ministry of Education of China – National Scholarship (Top 1 %, Multiple years)
· Southwest Jiaotong University – Si Shi Yang Hua Medal Winner (Top 0.05 %)
· Southwest Jiaotong University – 1st Prize Scholarship (Top 5 %, Multiple years)
· Ministry of Education of China – 2nd Prize of National Mechanical Design Competition