

XUXIAO LI

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EDUCATION

Tongji University <i>B.S./Aircraft Manufacturing Engineering</i>	Shanghai, China Jun. 2015
University of Utah <i>M.S./Mechanical Engineering</i> <i>Ph.D./Mechanical Engineering, Advisor: Prof. Wenda Tan</i>	Salt Lake City, Utah May 2019 Expected Dec. 2020

RELEVANT COURSEWORK

Optics	Heat Transfer	Thermodynamics
Computational Fluid Dynamics	Turbulence	Kinetics
Machine Learning	Radiation	Numerical Solutions of PDEs

RESEARCH EXPERIENCE

Laser Absorption by a Powderbed 2015 – 2016

- Implemented the rain-dropping algorithm to generate randomly packed beds of powders as in typical laser powder bed fusion processes.
- Implemented the ray-tracing algorithm to model the multiple reflections of a laser beam on the surfaces of powders. Optimized the ray-tracing by a tree-search algorithm for laser incidence location.
- Analyzed the laser absorption distribution within the powderbed. Conducted parametric studies with respect to powder size, powderbed thickness and powder material.

GEMS Maintenance 2016 – Now

- Self-learned a poor-documented legacy code (in Fortran, over 25000 lines), General Equation Mesh Solver (GEMS), for solving general conservative PDE's with general unstructured mesh and MPI parallelization.
- Documented the methodology of GEMS. Designed and conducted multiple benchmark CFD simulations for the verification of GEMS.
- Modified subroutines for flux computation based on recent publications from original developers of GEMS. Achieved improved accuracy for unsteady problems.
- Added multiple modules (over 10000 lines) to enable multi-phase flow computations based on the level-set method, named as Awkward Level-Set GEMS (ALSGEMS). Designed and conducted multiple benchmark simulations for the verification of ALSGEMS.

Cellular Automata Simulation for Grain Nucleation and Growth 2016 – 2018

- Developed a thermal model to simulate the heat conduction and temperature field in direct laser deposition processes based on the GEMS code.
- Implemented the Cellular Automata (CA) algorithm to simulate the grain nucleation and growth with the temperature output from the thermal model. Parallelized the

CA algorithm with OpenMP. Implemented a dynamic scheduling scheme to alleviate computational cost.

- Analyzed the characteristics of the simulated grain structure with MTEX. Validated the simulation results with both analytical models and EBSD experiments in literature.
- Conducted numerical experiments on the effects of nucleation conditions on the grain size, shape and texture in the builds of direct laser deposition processes.

PUBLICATION

- **Li, X.**, Tan, W., 2016. Numerical investigation of laser absorption by metal powder bed in selective laser sintering processes. Solid Freeform Fabrication Symposium 2016, Austin, TX.
- **Li, X.**, Tan, W., 2018. Numerical investigation of effects of nucleation mechanisms on grain structure in metal additive manufacturing. Computational Material Science, 153, pp. 159-169.
- Kouraytem, N., **Li, X.**, Cunningham, R., Zhao, C., Parab, N., Sun, T., Rollett, A.D., Spear, A.D., Tan, W., 2019. Effect of laser-matter interaction on molten pool flow and keyhole dynamics. Physical Review Applied, 11(6), p.064054.
- Zhao, C., Guo, Q., **Li, X.**, Parab, N., Fezzaa, K., Tan, W., Chen, L., Sun, T., 2019. Bulk-explosion-induced metal spattering during laser processing. Physical Review X, 9(2), p.021052.
- **Li, X.**, Zhao, C., Sun, T., Tan, W., 2020. Revealing transient powder-gas interaction in laser powder bed fusion process through multi-physics modeling and high-speed synchrotron x-ray imaging. Additive Manufacturing, 35, p.101362.
- **Li, X.**, Tan, W., 2020. Numerical modeling of powder-gas interaction in laser powder bed fusion process. Journal of Manufacturing Science and Engineering, accepted.

TECHNICAL SKILLS

- *Computer Pragmatics*: Linux, Vim, Git, Latex
- *Programming Language*: Fortran, c/c++, Python, MATLAB
- *Commercial Software*: Comsol, Abaqus
- *High Performance Computing*: MPI, OpenMP, Intel Profiling Tools and Debugger

TEACHING ASISTANTSHIPS

Manufacturing for Engineering Systems

Fall 2016, Spring 2017, Fall 2017