

David O. McLaurin

Curriculum vitae

July 31, 2013

Mississippi State University

Email: d.mclaurin@msstate.edu | Phone: (662) 325-7296 | Fax: (662) 325-7692

Address: HPC², 2 Research Blvd, Starkville, MS 39759

Education

- | | |
|------|---|
| 2010 | Ph.D. Department of Aerospace Engineering , Mississippi State University.
CFD/Meshing/Geometry |
| 2007 | B.S. Department of Aerospace Engineering, Mississippi State University. |
| 2007 | Minor, Department of Mathematics and Statistics, Mississippi State University. |

Appointments

- | | |
|----------------|---|
| 2010 - Present | Assistant Research Professor, HPC ² /CAVS Mississippi State University |
| 2010 | Research Associate II, HPC ² /CAVS Mississippi State University |

Publications

Refereed Journal Articles

- | | |
|------|---|
| 2012 | [1] D. McLaurin et al. “Repairing Unstructured Triangular Mesh Intersections”.
In: <i>International Journal for Numerical Methods in Engineering</i> 93 (3 2013),
pp. 266–275 |
|------|---|

Refereed Conference Proceedings

- | | |
|------|--|
| 2013 | [1] D. Thompson et al. “Discrete Surface Evolution and Mesh Deformation for
Aircraft Icing Applications”. In: <i>Proceedings of 5th Atmospheric and Space Envi-
ronments Conference</i> . 2013 |
| | [2] D. McLaurin and S. Shontz. “Automated Edge Grid Generation Based on Arc-
Length Optimization”. In: <i>Proceedings of 22nd International Meshing Roundtable</i> .
2013 |
| 2012 | [3] D. McLaurin. “Automated Curvature-Based Edge Grid Generation”. In: <i>Pro-
ceedings of AlaSim International Modeling and Simulation Conference</i> . 2012 |
| | [4] M. Remotigue, D. McLaurin, and D. Marcum. “An Octree-Based Offset Sur-
face Mesh”. In: <i>Proceedings of AlaSim International Modeling and Simulation
Conference</i> . 2012 |

Manuscripts in Submission

- | | |
|------|--|
| 2012 | [1] D. McLaurin. “Discrete Edge Extension: A New Discrete Mesh Operation”.
In: <i>International Journal for Numerical Methods in Engineering</i> (2013) |
|------|--|

- 2013
- [1] D. McLaurin et al. “Development of a Physics-Based Interpolation Procedure for Spatial Temperature Fields”. In: *Journal of Geophysical Research* (2013)
 - [2] D. McLaurin and S. Bhushan. “Physics-Based Adaptive Mesh Refinement for Hybrid RANS/LES Simulations”. In: *Computers & Fluids* (2013)
 - [3] D. McLaurin. “Discrete Edge Extension: A New Discrete Mesh Operation”. In: *Computer Aided Geometric Design* (2013)
 - [4] S. Bhushan and D. McLaurin. “Uncertainty Quantification Methodology for Hybrid RANS/LES Simulations”. In: *International Journal of Uncertainty Quantification* (2013)
 - [5] D. McLaurin and S. Shontz. “On Surface Mesh Optimality: Representation Deficit as Refinement Parameter”. In: *Engineering with Computers* (2013)

Web-Based Publications

- 2012 - Present D. Marcum and D. McLaurin. *AFLR3 Unstructured Grid Generator*. <http://www.simcenter.msstate.edu/docs/aflr3>. 2013
- 2010 - Present D. McLaurin, M. Remotigue, and E. Blades. *SolidMesh: 3D User’s Manual*. <http://www.simcenter.msstate.edu/docs/solidmesh>. 2013
- 2008 - Present D. McLaurin, M. Remotigue, and E. Blades. *GridRx: Grid Topology Repair and Feature Removal Toolkit and Library*. <http://www.simcenter.msstate.edu/docs/gridrx>. 2010

Thesis

- 2010 D. McLaurin. *Algorithms and Methods for Discrete Mesh Repair*. Mississippi State University. 2010

Funding

- Total:**\$ 1,710,658, **Principal:**\$ 122,524, **Co-PI:** \$1,588,134
- 2013
- [1] D. McLaurin, R. Weed, and R. King. *Research to develop a framework for Grid Adaptation and Deformation for use in large-scale, high fidelity simulations*. \$122,524. 7/1/13-6/30/14
 - [2] R. King et al. *SimBRS WD 50: TARDEC High Performance Computing (HPC) Operations Improvement*. \$119,997. 7/1/12-11/30/12
- 2012
- [3] E. Luke, Q. Arnoldus, and D. McLaurin. *A Comprehensive Solid Rocket Modeling Tool*. \$261,976. 7/1/12-6/30/24
 - [4] D. Marcum and D. McLaurin. *Improvement of Robust, Production Quality Unstructured Mesh Generation*. \$105,150. 10/1/12-9/30/13
 - [5] D. Marcum and D. McLaurin. *AFLR Enhancements*. \$121,311. 9/1/12-8/30-13

- [6] S. Bhushan, D. McLaurin, and B. Cooke. *The Development of a Graphics User Interface (GUI) Based Research Tool for Decision Support System for Wildfire Management and Prevention*. \$2,000. 10/1/2012-9/30/13
- 2011 [7] D. Marcum, M. Remotigue, and D. McLaurin. *AFLR/SolidMesh Enhancements, PP-CFD-KY03-008-P3*. \$176,700. 8/30/11-9/1/12
- [8] D. Thompson et al. *Robust Meshing for Aircraft Icing Applications*. \$501,000. 12/7/11-12/6/14
- 2010 [9] D. Marcum, M. Remotigue, and D. McLaurin. *AFLR/SolidMesh Enhancements*. \$125,000. 8/30/10-9/1/11
- [10] **marcum10misc**

Awards and Honors

2008-2010 Bagley College of Engineering Fellow

Invited Talks

- 2011 [1] “Algorithms for Mesh Repair”, US Army Engineering Research and Development Center.
- [2] “SolidMesh/AFLR3 Training”, United States Air Force Base, 2011.
- [3] “SolidMesh/AFLR3 Training”, Eglin Air Force Base, 2011.

Conference Activity/Participation

- 2014 [1] D. McLaurin, S. Shontz, and D. Marcum. *Multi-core/Multi-threaded mesh generation: towards billion element meshes on desktop hardware*. Presented at Minisymposium on “Recent Advances in Parallel Meshing Algorithms” in SIAM Conference on Parallel Processing for Scientific Computing. 2014
- 2013 [2] S. Shontz, D. Colbry, and D. McLaurin. *A Machine Learning Tool for Automated Image Segmentation*. Proceedings of Minisymposium “Modeling and Computational Methods for Mathematical Biology and Medicine”, Presented at International Conference on Applied Mathematics, Modeling, and Computational Science. 2013
- [3] D. McLaurin and S. Shontz. “Automated Edge Grid Generation Based on Arc-Length Optimization”. In: *Proceedings of 22nd International Meshing Roundtable*. 2013
- [4] D. McLaurin and S. Shontz. *Optimal Mesh Generation Based on Representation Deficit*. Presented at Symposium on Mesh Trends IX, 12th U.S. National Congress on Computational Mechanics (USNCCM12). 2013
- [5] S. Bhushan and D. McLaurin. *Uncertainty Quantification of Hybrid RANS/LES Simulations Using Turbulence-Length-Scale-Based Adaptive Mesh Refinement*. Presented at Symposium on Goal-Oriented Error Estimation, 12th U.S. National Congress on Computational Mechanics (USNCCM12). 2013

- [6] S. Shontz and D. McLaurin. *A Topology-Adaptive Level Set/mesh Deformation Technique for Boundary Evolution Tracking: Applications to Brain Biomechanics*. Presented at Symposium on Geometric Methods for Computational Mechanics, 12th U.S. National Congress on Computational Mechanics (USNCCM12). 2013
- 2012 [7] D. McLaurin. “Automated Curvature-Based Edge Grid Generation”. In: *Proceedings of AlaSim International Modeling and Simulation Conference*. 2012
- [8] D. McLaurin. “Automated Discretization of Digital Curves through Local or Global Constrained Optimization”. In: *NDIA 3170 Physics-Based Modeling in Design and Develop for US Conference*. 2012
- [9] A. Shanker, S. Bhushan, and D. McLaurin. *Uncertainty Quantification for Hybrid RANS/LES Turbulent Simulations*. Presented at 9th Differential Equations and Computational Simulations Conference. 2012

Teaching

2013	Convective Heat Transfer
	Computational Geometry
2012	Engineering Analysis
	Intermediate Fluid Mechanics
	Thermodynamics
2011	Heat Transfer
	Thermodynamics

Research/Interests

Computational Fluids, Fluid Mechanics, Turbulence Modeling, Numerical Methods, Fluid-Structure Interaction

Discrete/Differential Geometry, Mesh Generation/Repair, Computational Geometry, Optimal Mesh Generation, Mesh Adaptation/Deformation

Parallel Computing (Multi-core, Shared/Distributed Memory, GPU-Acceleration), High-Performance Computing

Software Development

2013 - Present	Developer, Code Maintenance, UniformCore: Uniform Core mesh generation for large-scale mesh applications, 12,853 lines of C++.
2010 - Present	Developer, Code Maintenance, SolidMesh: is an unstructured grid generation system that is being developed by the ERC Computational Simulation and Design Center (SimCenter) at Mississippi State University (Current Version, 5.10.1), 232,434 lines of C,C++.
2007 - Present	Developer, Code Maintenance, GRX: Grid Topology Repair and Feature Removal Toolkit and Library (Current Version, 1.3), 18,401 lines of C,C++.

Service To Profession

2012-Present Peer Review (7 total articles): International Meshing Roundtable, MSU-UAB
Differential Equations & Computational Simulations Conference

Department/University Service

Masters Students

2012 M. Trcalek. *An octree surface wrapping algorithm to recover building structures*.
Mississippi State University. 2012

Graduate Faculty

2011-Present Department of Computational Engineering, Level I appointment

2011-Present Department of Mechanical Engineering, Level II appointment

2011-Present Department of Aerospace Engineering, Level II appointment

Extracurricular

2012-Present Faculty Advisor, Women's Club Soccer

2011-Present Faculty Advisor, Men's Club Soccer

2010-Present Faculty Advisor, Lambda Chi Alpha Fraternity

Professional Memberships/Affiliations

2010 American Institute of Aeronautics and Astronautics (AIAA)

2011 Institute of Electrical and Electronics Engineers (IEEE)