

Mohamed S. Ebeida

CONTACT

INFORMATION

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RESEARCH INTERESTS

Computational Geometry, Computer Graphics, Finite Elements, Computational Fluid Dynamics, Sampling Methods, Uncertainty Quantification.

EDUCATION

University of California, Davis, California USA

Ph.D., Mechanical and Aeronautical Engineering **Sept. 2008**

- Thesis: Simulation of unsteady incompressible turbulent flows using Galerkin finite element and adaptive grids
- Advisor: Professor Roger L. Davis
- Area of Study: Computational Fluid Dynamics

M.S., Applied Mathematics **June 2009**

- Thesis: Reduced order modeling of incompressible flows using proper orthogonal decomposition and Galerkin projection
- Advisor: Professor Roland W. Freund
- Area of Study: Reduced Order modeling

Alexandria University, Egypt

M.S., Naval Architecture and Marine Engineering Department. **June 2004**

- Thesis: Application of CFD to some flow problems associated with inland water transportation
- Advisor: Professor Shaher Sabit
- Area of Study: Ship Hydrodynamics

B.S., Naval Architecture and Marine Engineering Department , with Honors.

June 2000

ACADEMIC EXPERIENCE

Sandia National Laboratories, Albuquerque, NM

Postdoctoral researcher **May 2010 to present**

My main duties at SNL include conducting research in sampling methods and random Voronoi mesh generation for modelling of simulations with propagating fractures. The main task is to design, develop a standalone meshing library to help simulating carbon sequestration processes.

Carnegie Mellon University, Pittsburgh, PA USA

Postdoctoral researcher **Sept. 2008 to May 2010**

My main duties at CMU include conducting research in geometric modeling and mesh generation. The main task is to design, develop and implement a flexible software system for geometry-representation and mesh generation. This project is funded by the Naval Research Laboratory (Create-MG group) and includes the development of computational engineering tool sets for aircraft, ships and antenna in naval research.

University of California, Davis, California USA

Research Assistant

- Mechanical and Aero. Engineering dept. **Sept. 2005 to Sept. 2006**
- Dept. of Mathematics **Jan. 2008 to June 2008**

Teaching Assistant

- Mechanical and Aero. Engineering dept. (EME 106, EME 165, ENG 103, EME 50, EAE 138, ENG 4). **October 2006 to June 2008**
- Dept. of Physics. (Physics 9C) **March 2007 to June 2007**

Alexandria University, Egypt

Instructor

- Naval Architecture and Marine Engineering dept.
(Ship Machinery Drawing, Engineering Graphics and Computer Programming
for Naval Architects). **Sept. 2004 to June 2005**

Teaching Assistant

- Naval Architecture and Marine Engineering dept. (MR 111, MR 112, MR 141,
MR 224, MR 231, MR 232, MR 241, MR 261, MR 321, MR 331, MR 332,
MR 351, HS 365, MR 421). **Sept. 2000 to June 2005**

AWARDS AND
FELLOWSHIPS

The Meshing Maestro award from the 19th International Meshing Roundtable.

Chattanooga, Tennessee October 2010

Non-resident Tuition Fellowships from the Mechanical and Aeronautical Engineering
Dept. - UCD.

Fall 2005 - Winter 2006 - Spring 2006 - Fall 2006 - Winter 2007

ACADEMIC
ACTIVITIES

2012 Reviewer: SIGGRAPH Asia (Technical Briefs).

2012 Reviewer: IEEE Trans. on Visualization and Computer Graphics.

2012 Reviewer: SIGGRAPH Asia.

2012 Reviewer, The 21st International Meshing Roundtable.

2012 Reviewer: Engineering with Computers.

2012 Reviewer: IEEE Vis (SciVis).

2011 Reviewer, The 20th International Meshing Roundtable.

2011 Reviewer, Engineering with Computers.

2011 Reviewer, Communications in Nonlinear Science and Numerical Simulation.

2009 Reviewer, The 18th International Meshing Roundtable.

2008 Reviewer, The 17th International Meshing Roundtable.

INVITED TALKS

Improved Poisson-disk sampling for graphics and meshing applications, ECE dept., UC-Davis.

Host: John D. Owens (jowens@ece.ucdavis.edu) **Davis, CA, Oct. 5, 2012**

K-d Darts: Sampling by k-dimensional flat searches, Nuclear Eng. dept., NCSU.

Host: Hany Abdel-Khalik (hsabdelk@ncsu.edu) **Raleigh, NC, Apr. 3, 2012**

Random unstructured meshes via maximal Poisson-disk sampling, CD-adapco Austin.

Host: Scott Canann (scott.canann@cd-adapco.com) **Austin, TX, Dec. 13, 2011**

Random unstructured meshes via maximal Poisson-disk sampling, ICES, UT Austin.

Host: Chandrajit Bajaj (bajaj@cs.utexas.edu) **Austin, TX, Dec. 12, 2011**

Random unstructured meshes via maximal Poisson-disk sampling, Computing Sciences Seminars, Lawrence Berkeley National Lab.

Host: Taghrid Samak (tsamak@lbl.gov) **Berkeley, CA, Dec. 2, 2011**

Random unstructured meshes via maximal Poisson-disk sampling, MAE Graduate Seminar, UC Davis.

Host: Jean-Jacques Chattot (jjchattot@ucdavis.edu) **Davis, CA, Dec. 1, 2011**

Random unstructured meshes via maximal Poisson-disk sampling, Dept. of Mechanical Engineering, Stanford University.

Host: Gianluca Iaccarino (jops@stanford.edu) **Palo Alto, CA, Nov. 28, 2011**

New approaches to solve the meshing problem, Naval Research Laboratory.

Host: Saikat Dey (saikat.dey@nrl.navy.mil) **Washington DC, VA, Oct. 17, 2011**

Mesh generation for modeling and simulation of carbon sequestration process, Graduate Seminar, Dept. of Civil Engineering, UNM.

Host: Mahmoud Reda Taha (mrtaha@unm.edu) **Albuquerque, NM, April 1, 2011**

Toward an Optimal Numerical Solution of the Flow Problem through Mesh Generation, Los Alamos National Laboratory.

Host: Rao Garimella (rao@lanl.gov) **Los Alamos, NM, Feb. 2, 2010**

Toward an Optimal Numerical Solution of the Flow Problem through Mesh Generation, Sandia National Laboratories.

Host: Patrick Knupp (pknupp@sandia.gov) **Albuquerque, NM, Jan. 19, 2010**

Toward an Optimal Numerical Solution of the Flow Problem through Mesh Generation, Intel Corp.

Host: Stefan Halama (Stefan.Halama@intel.com) **Hillsboro, OR, Jan. 8, 2010**

Fast Adaptive Hybrid Mesh Generation Based on Quad-tree Decomposition, Bay Area Scientific Computing Day, MSRI - UC Berkeley.

Host: Zhaojun Bai (bai@cs.ucdavis.edu) **Berkeley, CA, March 29, 2008**

CONFERENCE
PRESENTATIONS

2012

K-d Darts: Sampling by k-dimensional flat searches, SIAM conference on Uncertainty Quantification, April 2-5, Raleigh 2012.

2011

Mesh generation for modeling and simulation of carbon sequestration process, SIAM conference on Computational Science and Engineering, February 28 - March 3, Reno 2011.

Conforming Voronoi meshing based on maximal Poisson-disk sampling, 3rd International conference on Computational Methods in Engineering and Science, South Lake Tahoe 2011.

LBMD: A Layer-Based Mesh Datastructure tailored for generic implementations, 20th AIAA CFD conference, June 27-30, Honolulu, 2011.

Conforming Voronoi meshing for three dimensional domains with multiple cracks, 11th US Congress on Computational Mechanics, July 25-28, Minneapolis 2011.

Efficient and good Delaunay meshes from random points, SIAM conference on Geometric and Physical Modeling, October 24 - 27, Orlando 2011.

2010

Q-TRAN: A new approach to transform triangular meshes into quadrilateral meshes locally, 19th International Meshing Roundtable, October 3-6, Chattanooga 2010.

2009

Mesh insertion of hybrid meshes, 18th International Meshing Roundtable, Salt Lake City, Utah October 25-28, 2009.

Incompressible flow simulations at high Reynolds numbers using Galerkin finite element with spatial/temporal adaptation, 19th AIAA Computational Fluid Dynamics, San Antonio, Texas, June 22-25, 2009.

Unsteady incompressible flow simulation using Galerkin finite element with spatial/temporal adaptation, 47th AIAA Aerospace Sciences Meeting, Orlando, Florida, January 5-8, 2009.

2008

A new technique for quad-dominant adaptive mesh generation, 17th International Meshing Roundtable, Pittsburgh, October 12-15, 2008.

Fast adaptive hybrid mesh generation based on quad-tree decomposition, AIAA 38th Fluid Dynamics Conference and Exhibit, Seattle, June 23 - 26, 2008.

Google Scholar Statistics: Citations (49), h-index(3), i10-index(2).

2012

M. S. Ebeida, S. A. Mitchell, A. Patney, A. A. Davidson, and J. D. Owens, “A simple algorithm for maximal Poisson-disk sampling in high dimensions”, *Computer Graphics Forum (Eurographics 2012)*, 31(2), May 2012.

S. A. Mitchell, A. Rand, M. S. Ebeida and C. Bajaj, “Variable radii Poisson-disk sampling”, *24th Canadian Conference on Computational Geometry (CCCG’12)*, Charlotte-town, August 2012.

S. Tzeng, A. Patney, A. A. Davidson, M. S. Ebeida, S. A. Mitchell, and J. D. Owens, “High quality parallel depth-of-field using line samples”, *High Performance Graphics*, Paris June 2012.

M. S. Ebeida, A. Patney, K. R. Dalbey, A. A. Davidson, S. A. Mitchell, and J. D. Owens “k-d Darts: Sampling by k-dimensional flat searches”, *SIGGRAPH Asia*, Singapore Nov. 28 - Dec. 1, 2012 (**conditionally accepted**).

2011

M. S. Ebeida, A. Patney, S. A. Mitchell, A. A. Davidson, P. M. Knupp, and J. D. Owens, “Efficient maximal Poisson-disk Sampling”, *ACM Transactions on Graphics (SIGGRAPH 2011)*, 30(4), August 2011.

M. S. Ebeida, A. Patney, J. D. Owens and E. Mestreau, “Isotropic Conforming Refinement of Quadrilateral and Hexahedral Meshes using Two-Refinement Templates”, *International Journal for Numerical Methods in Engineering*, 88(10): 974-985.

M. S. Ebeida and P. M. Knupp, “LBMD: A Layer-Based Mesh Datastructure tailored for generic implementations”, *20th AIAA CFD conference*, June 27-30, Honolulu, 2011. AIAA-2011-3541

M. S. Ebeida, S. A. Mitchell, A. A. Davidson, A. Patney, P. M. Knupp, and J. D. Owens, “Efficient and Good Delaunay meshes from random points”, *Computer Aided Design*, 43(11): 1506-1515.

M. S. Ebeida, P. M. Knupp, V. J. Leung, J. E. Bishop, and M. J. Martinez, “Mesh generation for modeling and simulation of carbon sequestration process”, *DOE Scientific Discovery through Advanced Computing (SciDAC) conference*, July 10-14, Denver, 2011. (invited paper)

M. S. Ebeida, S. A. Mitchell, “Uniform random Voronoi meshes”, *20th International Meshing Roundtable*, Paris October 23-26, 2011.

2010

M. S. Ebeida, R. L. Davis and R. W. Freund, “A new fast hybrid grid generation technique for arbitrary two-dimensional domains”, *International Journal for Numerical Methods in Engineering*, 84(3):305-329.

X. Liang, M. S. Ebeida and Y. Zhang, “Guaranteed-Quality All-Quadrilateral Mesh

Generation with Feature Preservation”, Computer Methods in Applied Mechanics and Engineering, 199(29):2072-2083.

M. S. Ebeida, K. Karamete, E. Mestreau, and S. Dey, “Q-TRAN: A new approach to transform triangular meshes into quadrilateral meshes locally”, 19th International Meshing Roundtable, Chattanooga, Tennessee October 3-6, 2010.

2009

M. S. Ebeida, E. Mestreau, Y. Zhang and S. Dey, “Mesh Insertion of Hybrid Meshes”, 18th International Meshing Roundtable, Salt Lake City, Utah October 25-28, 2009.

X. Liang, M. S. Ebeida and Y. Zhang, “Guaranteed-Quality All-Quadrilateral Mesh Generation with Feature Preservation”, 18th International Meshing Roundtable, Salt Lake City, Utah October 25-28, 2009.

A. Patney, M. S. Ebeida and J. D. Owens, “Parallel View-Dependent Tessellation of Catmull-Clark Subdivision Surfaces”, High Performance Graphics 2009, New Orleans, Louisiana, August 1-3, 2009.

M. S. Ebeida and R. L. Davis, “Incompressible Flow Simulation at High Reynolds Numbers using Galerkin Finite Element with Spatial/Temporal Adaptation”, 19th AIAA Computational Fluid Dynamics, San Antonio, Texas, June 22-25, 2009. AIAA-2009-3793

M. S. Ebeida, R. L. Davis and R. W. Freund, “Unsteady Incompressible Flow Simulation using Galerkin Finite Element with Spatial/Temporal Adaptation”, 47th AIAA Aerospace Sciences Meeting, Orlando, Florida, January 5-8, 2009. AIAA-2009-1128.

2008

M. S. Ebeida and R. L. Davis, “Fast Adaptive Hybrid Mesh Generation Based on Quadtree Decomposition”, AIAA 38th Fluid Dynamics Conference and Exhibit, Seattle 23 - 26 June 2008. AIAA-2008-4141

TECHNICAL SKILLS

Programming: C, C++, C#, Qt, Visual Basic, Fortran, MPI, Open MP, OpenGL.

MATLAB experience: linear algebra, Fourier transforms, nonlinear numerical methods, polynomials, statistics, visualization

Applications: AutoCad, 3dsmax, Paraview, T_EX, L^AT_EX, B_IB_TE_X, Microsoft Office, and other common productivity packages for Windows, OS X, and Linux platforms

Operating Systems: Microsoft Windows XP/2000, Apple OS X, Linux

SOFTWARE

Meera is an object oriented framework that I have developed during my graduate studies to perform numerical simulation for various fluid flow problems.

It has three versions; a platform independent one written in C++; a serial version written in C# under Visual Studio.Net and a parallel one written in Fortran and MPI.

It serves as a development library, as well as a ready to use application.

Meera can be used in unsteady turbulent flows simulations based on Finite Volume and Galerkin Finite Element methods. The solver in Meera is coupled with an adaptive dynamic remesher.

Meera has the capability of generating and performing operations on sparse tensors efficiently.

REFERENCES

James R. Stewart
Manager (Org. 1441)
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