Kausik Chatterjee
1807 N. Joshua Avenue • Clovis, CA 93611
PHONE (559) 325-3779, (559) 278-6038 • E-MAIL kchatterjee@csufresno.edu
chattk2@alum.rpi.edu

January 13, 2004

Dear Sir or Madam:

My name is Kausik Chatterjee. I am an assistant professor in electrical and computer engineering at California State Universiy, Fresno. I am writing this letter to explore the possibility of a research fellowship within your organization.

My broad research interests involve the development of stochastic algorithms for Maxwell's equations and other important equations in nature. These algorithms require no discretization meshing, and hence have low memory requirement. These algorithms are inherently parallelizable and a linear increase in speed is expected with the increase in the number of processors. The interdisciplinary application areas that I am exploring include IC interconnect modeling, thermal analysis of IC chips, semiconductor device modeling, ferrohydrodynamics and antenna design.

In addition to the research activities described above, for the last few months I have been working on an eddy current problem in a conducting and magnetic spheroid. This problem was originally posed to me by Professor Markus Zahn of Massachusetts Institute of Technology as a difficult and lingering problem and I consider its solution to be one of my important research accomplishments. In collaboration with Professor Zahn, I am currently writing a paper on that subject, which will be submitted to the IEEE Transactions on Magnetics. I am also collaborating with Professor Zahn on some important problems in the area of ferrohydrodynamics, which is an interdisciplinary area between electromagnetics, fluid mechanics and colloid chemistry. In the coming years, I hope to make some significant contributions in this area.

Summarizing, I have described my current research activities the details of which are given in my statement on research interests. I believe that some of these activities could be relevant to the goals of Argonne National Laboratory. I also believe that a fellowship at Argonne National Laboratory will help me increase the pace of these activities and parallelize my algorithms on high performance computers. It will also provide me with the opportunity to be involved in existing research projects and discover new and exciting areas of research.

Thanking you for your consideration,

Kausik Chatterjee
Assistant Professor
Department of Electrical &
Computer Engineering
California State University, Fresno

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Objective

A position involving research in computation.

Citizenship

Citizen of India and a permanent resident in the United States, application for citizenship pending with the Immigration and Naturalization Services, naturalization interview scheduled on January 29, 2004 and expect to be a citizen of the United States around then.

Education

Doctor of Philosophy in Electrical Engineering, Rensselaer Polytechnic Institute, May, 2002, GPA: 4.0/4.0. (Transferred from Ohio State University)

Dissertation Title: Development of a floating random-walk algorithm for solving Maxwell's equations in complex IC-interconnect structures.

Master of Technology in Nuclear Engineering, Indian Institute of Technology, Kanpur, India, June, 1995, GPA: 9.6/10.0.

Thesis Title: Simulation studies on large area solid state neutron detectors using Monte Carlo technique.

Bachelor of Engineering in Electrical Engineering, Jadavpur University, Calcutta, India, June, 1992, Overall Percentage of Marks secured: 78%, First Class with Honors.

Appointments

1) August, 2002 – present, Assistant Professor (tenure-track), California State University, Fresno, CA.
2) 08/2001-05/2002, Adjunct faculty, Electrical, Computer and Systems Engineering, Rensselaer Polytechnic Institute, Troy, NY.
3) 01/1999-08/2001, Graduate Research Assistant, Rensselaer Polytechnic Institute, worked in projects funded by Semiconductor Research Corporation (SRC) and Focus Research Center (FRC).
4) 08/1998-05/1999, Graduate Teaching Assistant, Rensselaer Polytechnic Institute, Troy, NY.
5) 09/1996-07/1998, Graduate Research Assistant, Ohio State University, Columbus, OH.
6) 07/1992-07/1993, Junior Engineer, Steel Authority of India, Ltd., Durgapur, India, worked at a 120 MW thermal power plant.

Fellowships/Honors

A) Member of IEEE, American Physical Society, Applied Computational Electromagnetics Society.
B) The Charles M. Close Doctoral Prize, Rensselaer Polytechnic Institute, Troy, NY, 05/2002.
C) Intel Doctoral Fellowship, Rensselaer Polytechnic Institute, Troy, NY, 05/2001-05/2002.

D) Reviewer, IEEE Transactions on Microwave Theory and Techniques, Circuits and Systems Society.
E) University Graduate Fellowship, Ohio State University, 09/1995-08/1996.
F) Government of India Fellowship, Indian Institute of Technology, Kanpur, 08/1993-06/1995.
G) Reviewer for McGraw-Hill publications.
H) Session chair for a session entitled "Modeling and extraction of parasitics in integrated circuits" as a part of VLSI Multilevel Interconnection Conference, Marina Del Rey, CA, September 23-26, 2003.

Publications

Journal Publications

1) K. Chatterjee and Y.L. Le Coz, "A Floating Random-Walk Algorithm based on Iterative Perturbation Theory: Solution of the 2D Vector-Potential Maxwell-Helmholtz Equation ", Journal of Applied Computational Electromagnetics Society, Vol. 18, No. 1, pp. 48-57, March, 2003.
2) K. Chatterjee, P. Matos and Y.L. Le Coz, "A Novel Dirichlet-Neumann Random-Walk Algorithm for the Solution of Time-Harmonic Helmholtz Equation at Multiple Wavelength Length Scales: 1D and 2D Verification", Journal of Applied Computational Electromagnetics Society. (Accepted for publication in March, 2004)
3) K. Chatterjee and M. Zahn, "Steady-state and transient eddy currents in a prolate conducting spheroid in changing magnetic fields." (In preparation and will be submitted to IEEE Transactions on Magnetics)
4) K. Chatterjee and P. Matos, "A novel stochastic algorithm for the solution of nonlinear Poisson equation in MOS structures". (In preparation and will be submitted to IEEE Transactions on Solid State Devices)
5) K. Chatterjee and P. Matos, "A novel hybrid algorithm assimilating stochastic techniques with the method of moments for the electromagnetic analysis of microwave structures." (In preparation and will be submitted to Microwave Theory and Techniques)

Conference Publications

1) K. Chatterjee, P. Matos and Y.L. Le Coz. "A floating random-walk solution for the transverse magnetic electromagnetic problem: A homogeneous benchmark," Applied Computational Electromagnetics Society Conference, Syracuse, NY, April, 2004 (accepted).
2) K. Chatterjee, P. Matos, B. Hawkins and S. Jahanian, "A novel stochastic algorithm for the extraction of frequency-independent partial inductances in digital IC interconnect structures and a frequency-dependent generalization," Applied Computational Electromagnetics Society Conference, Syracuse, NY, April, 2004 (accepted).
3) *(Short Abstract)* K. Chatterjee, P. Matos, Y. L. Le Coz, "An iterative perturbation based stochastic algorithm for the transverse magnetic problem: A 2D benchmark," Progress in Electromagnetics Research Symposium, Pisa, Italy, March, 2004 (accepted).
4) K. Chatterjee, P. Matos, B. Hawkins and S. Jahanian, "Stochastic extraction of partial inductances in digital IC interconnect structures: 2D verification", VLSI Multilevel Interconnection Conference, Marina Del Rey, CA, September 23-25, 2003.
5) S. Jahanian and K. Chatterjee, "On the reliability and failure analysis of Very large Scale Integrated Circuits", VLSI Multilevel Interconnection Conference, Marina Del Rey, CA, September 23-25, 2003.
6) K. Chatterjee, P. Matos and Y.L. Le Coz, "A Novel Dirichlet-Neumann Algorithm for Electromagnetic Analysis of IC Interconnects Beyond Quarter-Wavelength Length Scales", The 19th Annual Review of Progress in Applied Computational Electromagnetics, pp. 598-603, Monterey, CA, March 24-28, 2003.

7) K. Chatterjee and Y.L. Le Coz, "A Floating Random-Walk Algorithm for IC-Interconnect Analysis: Theory and 2D Skin-Effect Verification", VLSI Multilevel Interconnection Conference, Singapore, November 18-19, 2002.
8) K. Chatterjee, R.B. Iverson and Y.L. Le Coz, "A New Dirichlet-Neumman Random-Walk Algorithm for Solving Maxwell's Equations in IC-Interconnects: 1D Verification", VLSI Multilevel Interconnection Conference, Santa Clara, CA, November 2001.
9) K. Chatterjee, R.B. Iverson and Y.L. Le Coz, "Development of a Random-Walk Algorithm for IC-Interconnect Analysis: 2D TE Benchmarks, Materially Heterogeneous Domains", VLSI Multilevel Interconnection Conference, Santa Clara, CA, pp. 374-379, June 2000.
10) K. Chatterjee, R.B. Iverson and Y.L. Le Coz, "Development of a Random-Walk Algorithm for IC-Interconnect Analysis: 2D TE Benchmarks, Materially Homogeneous Domains", International Interconnect Technology Conference, San Francisco, CA, pp. 167-169, June 2000.
11) Y.L. Le Coz, K. Chatterjee and R.B. Iverson, "A Floating-Random-Walk Algorithm for solving Maxwell's Equations in Multilevel IC-Interconnect Structures: 1D Verification", Proceedings VLSI Multilevel Interconnection Conference, Santa Clara, CA, pp. 463-467, September, 1999.
12) (*Short Abstract*) K. Chatterjee and P. Matos, "Inductance Extraction at Multi-GHz Frequencies Using a Meshless Stochastic Approach", Progress in Electromagnetics Research Symposium, Hawaii, October, 2003
13) (*Short Abstract*) K. Chatterjee and Y.L. Le Coz, "A Floating Random-Walk Algorithm based on Iterative Perturbation Theory: Solution of the Maxwell-Helmholtz Equation", American Physical Society Meeting, Salt Lake City, Utah, October, 2002.

Collaborations

1) Professor Markus Zahn, Electrical Engineering, Massachusetts Institute of Technology, Cambridge, MA, Ferrohydrodynamics.
2) Professor Yannick L. Le Coz, Electrical Engineering, Rensselaer Polytechnic Institute, Troy, NY, Development of stochastic algorithms for nonlinear problems.
3) Dr. Johann Nittmann, Intel Corporation, Shrewsbury, Massachusetts, Development of stochastic algorithms for parameter extraction of integrated circuits.

Grant Proposals

Research

1) *Floating Random-Walk Algorithms for Maxwell's Equations and Other Important Equations in Nature*, Submitted to the National Science Foundation for Career Award, July, 2003, Proposed Amount: 400k, Proposed duration: 2004-2008.
2) *A Stochastic Solver for Extraction of Inductance in IC Interconnect Structures: A CsuFresno-Hewlett Packard Pilot Project*, Amount awarded for 2003-2004: 10k. It is expected that this pilot project will be transformed into a full scale project in the coming years.
3) *Stochastic solution of PEEC models of interconnect structures*, this proposal is currently being explored with Intel Corporation.
4) *Thermal Analysis of Digital IC Chips Using Random-Walk Technique*, this proposal will be submitted to the National Science Foundation in February, 2004.
5) *Parallelization of stochastic algorithms for interconnect modeling*, will be submitted to the Major Research Instrumentation (MRI) program of the National Science Foundation in January, 2004.
6) *Solution of Helmholtz equation in conducting, magnetic spheroids and ellipsoids*, will be submitted to the National Science Foundation in February, 2004.

Teaching Proposals

1) *A Magnetically Levitated Toy Train*, submitted to National Collegiate Inventors and Innovators Alliance, Proposed Amount: 20k. Proposed Duration: 06/04-06/06.
2) *The Engineering Institute: A RET site at California State University*, *Fresno*, submitted to National Science Foundation, Proposed amount: 450k. Proposed Duration: 03/04 – 0/07.

3) *Modeling and extraction of electrical parameters of IC interconnects at high frequencies: A, research-oriented, interdisciplinary course*, submitted to the National Science Foundation, Proposed amount: 30k. Proposed duration: 05/04-05/05.

Professional References

Markus Zahn
Thomas and Gerd Perkins Professor of Electrical Engineering
Director, VI-A Internship Program
Massachusetts Institute of Technology
Room 10-174
Cambridge, MA 02139
Tel: 617-253-4688
Fax: 617-258-6774
Email: zahn@mit.edu

Yannick L. Le Coz
Professor of Electrical Engineering
Rm. CII-6225
Center for Integrated Electronics
Rensselaer Polytechnic Institute
Troy, NY 12180
Tel: (518) 276-2937
Fax: (518) 276-8761
Email: lecozy@rpi.edu

Toh-Ming Lu
Professor of Physics
6017, Low Center of Industrial Innovation
Rensselaer Polytechnic Institute
Troy, NY 12180
Tel: (518) 276-2979
Fax: (518) 276-8761
Email: lut@rpi.edu

Ishwara Bhat
Professor of Electrical Engineering
6032 Jonsson Engineering Center
Rensselaer Polytechnic Institute
Troy, NY 12180
Tel: (518) 276-2786
Email: bhati@rpi.edu

Dr.Johann Nittmann
Senior Staff Engineer
MMDC
Intel Massachusetts, Inc.
334 South Street
Shrewsbury, MA 01545
Tel: (508) 841-1998
Email: Johann.Nittmann@intel.com