Curriculum Vitae

Rao V. Garimella

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Career Objective:

To develop and utilize frameworks for the solution of challenging computational problems in mechanical engineering.

Professional Interests (*Also see attached description of research interests*)

Unstructured Mesh Generation, Geometric Modeling, Computational Geometry, Finite Element Methods and Numerical Optimization. .

Education

Ph.D., Mechanical Engineering, Expected September 1998, Rensselaer Polytechnic Institute, Troy, NY.

M.S., Mechanical Engineering, 1992, Ohio University, Athens, OH.

B.S., Mechanical Engineering, 1989, S J College of Engineering, Mysore, India.

Experience

Research Assistant, Scientific Computation Research Center (SCOREC),
Rensselaer Polytechnic Institute, Troy, NY. (1993 - current)

Developed and supported research projects for sponsors including Ford, Pratt & Whitney, General Electric, Howmet Corp, PCC Airfoils, Electronic Data Systems (Unigraphics Division), MacNeal-Shwendler Corp, Wright-Patterson Air Force Base, Knolls Atomic Power Labs, Centric Engineering Systems, TMA Inc. and Simmetrix Inc.

Developed algorithms and large scale software for Automatic Mesh Generation. Also developed software for Automatic Model Generation, Geometric Modeling, Computational Geometry, Finite element pre- and post-processing and simple Finite Element Analyses.

- Automatic Boundary Layer Mesh Generation for Viscous Flow Simulations:
  Developed mesh generator capable of generating anisotropic meshes for capturing boundary layers and free shear layers in viscous flow simulations. The mesh generator is capable of generating boundary layer meshes for arbitrarily complex non-manifold geometric models created in CAD systems. Meshes from this software are currently being used in the industry to perform simulations on complex automobile exterior models with complete under-the-hood and under-the-body details and in automobile interiors. Meshes from this mesh generator have also been used for crystal growth simulations, turbulent flow simulations (Reynolds Averaged Navier Stokes Simulation), aeroacoustics analysis and blood flow simulations (Research supported by Simmetrix Inc.)
- Automatic Generation of Tetrahedral Meshes with Multiple Elements through the Thickness:
  Developed and implemented algorithms capable of refining an isotropic mesh through the thickness. The algorithm starts from an isotropic mesh of an arbitrarily complex geometric

model and automatically identifies the sections of the model which do not have enough mesh nodes through the thickness necessary to capture a nonlinear solution of a given order. It then anisotropically refines through the thickness introducing multiple nodes through the thickness without refinement in the other directions. These procedures have been very effective in generating meshes for casting simulations of airfoils, jet engine diffuser casings etc., for soft tissue analysis, for heat transfer analysis of a thin crucible for crystal growth and for thermal analysis in semiconductor devices (Research supported by Advanced Research Projects Aagency's Investment Casting Cooperative Arrangement or ARPA-ICCA project)

- Automated Model Generation:
  Developed algorithms for automatically creating non-manifold models from assemblies (supported by ARPA-ICCA and EDS/Unigraphics) and MultiChip Module (MCM) models from CIF data (supported by Wright-Patterson Air Force Base for the Electronic Packaging Interconnect Initiative project).
- Geometric Modeling and Computational Geometry:
  Developed generic interfaces to commercial modeler kernels (Parasolid and Shapes), modeled industrial parts and implemented spatial search algorithms.
- Finite Element Pre- and Post-processing:
  Developed software for automatically generating input files for soft-tissue analysis using the SCOREC Attribute Manager, SCOREC mesh databases and SCOREC model interfaces. Wrote translators from SCOREC mesh database for commercial FEA input formats (ABAQUS, PATRAN, Spectrum).

Teaching Assistant, Mechanical Engineering, Rensselaer Polytechnic Institute. (Aug. 1992 - May 1993)

Research Assistant, Mechanical Engineering, Ohio University, Athens, OH. (Jan. 1990 - Jul. 1992)

Investigated the kinematics, inverse kinematics and path planning algorithms for a free-floating mechanism (Research supported by National Science Foundation grant).

Teaching Assistant, Mechanical Engineering, Ohio University. (Jan. 1991 - Apr. 1991)

Project Engineer, Aerospace Engineering, Indian Institute of Science, Bangalore, India. (Jan. 1990 - Jun. 1990)

Practical Trainee, Wheel and Axle Plant, Bangalore, India. (Oct. 1985- Nov. 1985)

Technical Skills

Experience with numerical optimization, computational geometry, geometric modeling, visualization methods, Finite Element Methods, numerical solution of linear and non-linear systems.

Graduate courses in Applied Mathematics, Numerical Methods in Engineering, Optimization, Ordinary/Partial Differential Equations, FEM, Advanced FEM, FE programming, Solid mechanics, Plasticity, Potential flow theory, Heat Transfer, Vibrations, Dynamics and Control.

Software Skills

Programming:	Large scale software development and integration in broad range of computing environments
Languages:	C, C++, FORTRAN
Software Packages:	Parasolid, Shapes, Data Explorer, IMSL, Maple, Matlab, PATRAN, Abaqus, UG, Pro/E.
Operating Systems:	UNIX (Sun OS, Sun Solaris, SGI/IRIX, HP/UX, IBM/AIX, Linux), DOS

Selected Publications *(Also see attached list of lifetime publications)*

1. Shephard, M.S., Beall, M.W., Garimella, R. and Wentorf, R. "Automatic construction of 3-D models in multiple scale analysis," *Computational mechanics*, v 17, n3, pp. 196-207, Dec 1996.
2. Karamete, B.K., Garimella, R. and Shephard M.S. "Recovery of an Arbitrary Edge on an Existing Surface Mesh using Local Mesh Modifications," in preparation for submission to *International Journal of Numerical Methods in Engineering*, 1998.
3. Garimella, R.V. and Shephard M.S. "Unstructured Anisotropic Tetrahedral Mesh Generation for Viscous Flow Simulations in Complex Geometric Domains," in preparation for submission to *International Journal of Numerical Methods in Engineering*, 1998.
4. Garimella, R.V. and Shephard, M.S. "Boundary Layer Meshing for Viscous Flows in Complex Domains," accepted for publication in the *Proceedings of the 7th International Meshing Roundtable*, organized by Sandia National Laboratories, Dearborn, MI, Oct 1998.
5. Garimella, R., Shephard, M.S. and Webster, B.E. "Automatic Mesh Generation Of Complex Configurations Including Viscous Boundary Layers," to appear in *Proceedings of the 10th International Conference on Finite Elements in Fluids*, Tucson, AZ, Jan 98.
6. Garimella, R. and Shephard, M.S. "Tetrahedral Mesh Generation with Multiple Elements Through The Thickness," *Proceedings of 4th International Meshing Roundtable Conference*, pp. 321-334, Albuquerque, NM, Oct 95.
7. Agrawal S.K., Garimella, R. and Desmier, G. "Free-Floating Closed-Chain Planar Robots: Kinematics and Path Planning," in *Nonlinear Dynamics*, v 9, pp. 1-19, Feb 1996.

Awards and Honors

Letter of Commendation (with copies sent to Dean of Engineering, Rensselaer Polytechnic Institute) from Mr. Andrew Jay, Casting Discipline Chief, Pratt & Whitney, Hartford, CT for work on the ICCA project.

Scholarly and Professional Activities

President, American Society of Engineers from India, Athens, OH Chapter. (1991-1992)

Chairman, Co-founder, Association for Development of Science, Mysore, India. (1987-1989)

References

See attached list of references.