



**SAN DIEGO STATE
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**Computational Science
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PROFILE

Dr. Jose Castillo is a Professor in the Department of Mathematics and Statistics at SDSU. Dr. Castillo joined the SDSU faculty in 1987, the same year he received his Ph.D. in Applied Mathematics from the University of New Mexico. His Bachelor of Science in Mathematics is from Universidad Central de Venezuela (1978). He has a Masters of Art in Mathematics with a Minor in Computer Science from the University of Texas at Austin (1984). Dr. Castillo has a wide range interests in applied mathematics with emphasis in numerical solution of partial differential equations, scientific computing, and modeling. He has an ongoing cooperation with the CNLS and the T7 group at Los Alamos National Laboratory with research projects involving High Order Finite Difference Schemes, Error Analysis, and Adaptive Grid Generation methods.

Dr. Castillo advocates in-depth computational science and engineering knowledge, encourage training, and foster international cooperation among researchers, lecturers, and students. He has been the recipient of several grant awards from the National Science Foundation, The Alfred P. Sloan Foundation, and the Department of Energy. These grants have made possible the organization of a number of local and international workshops, conferences and institutes resulting in the establishment of international associations in applied mathematics, computational science and engineering in Peru, Brazil, Argentina, Venezuela, and Honduras.

In addition, Dr. Castillo is the Director of the Computational Science Research Center and Director of the Computational Science Programs. This Center facilitates cooperation between the University and Industry as well as National Laboratories. The center involves participation of researchers from applied mathematics, computer science, astronomy, physics, geophysics, and engineering. He is also working on building up partnerships with regional industry and national science labs with campus research efforts through the Applied Computational Science and Engineering Student Support (ACSESS) Program.

PROFESSIONAL PREPARATION

University of New Mexico	Applied Mathematics	Doctor of Philosophy, 1987
University of Texas at Austin	Mathematics, with Minor in Computer Science	Master of Arts, 1984
Universidad Central de Venezuela	Mathematics (Bachelor of Science with Thesis)	Licenciatura en Matematicas, 1978

ACADEMIC APPOINTMENTS

2001-Present Chair, Joint Doctoral Program in Computational Science
2000-present Professor, San Diego State University
1999-present Director, Computational Science Research Center
1992-1999 Associate Professor, San Diego State University
1987-1992 Assistant Professor, San Diego State University
1984-1987 Teaching Associate, University of New Mexico (lecturer)
1984-1985 Research Associate, Ecodynamics Research Associates, Albuquerque, New Mexico
1983-1984 Research Assistant, University of Texas at Austin

MEMBERSHIPS

Consortium for Mathematics and Its Applications, 2002
Society for Industrial and Applied Mathematics, 2002

PUBLICATIONS

Books:

Castillo, J.E. (1991). *Mathematical Aspects of Numerical Grid Generation*, SIAM Frontiers Series in Applied Mathematics Vol. 8.

Castillo, J.E. (in preparation) *Direct Optimization Grid Generation*.

Research Papers:

Castillo, J.E., & Yasuda, M. (2005) Linear Systems Arising for Second-Order Mimetic Divergence and Gradient Discretizations. *Journal of Mathematical Modeling and Algorithms*, 4: 67-82.

Torres C.R., Mascarenhas A. S., & Castillo J.E. (2004). Three-dimensional stratified flow over the Alarcon Seamount, entrance to the Gulf of California. Accepted for publication by *Deep Sea Res.*

Torres C.R., & Castillo J. E. (2003). Stratified Rotating Flow over Complex Terrain. *Journal Applied Numerical Mathematics*, 47, 531-541.

Larrazabal, G., Torres C.R., & Castillo J.E. (2003). An efficient and robust algorithm for 2D stratified fluid flow calculations. *Journal Applied Numerical Mathematics*, 47, 493-502.

Castillo, J.E., & Grone, R.D. (2003). A matrix analysis approach to high-order approximations for divergence and gradient satisfying a global conservation law, *SIAM Journal of Matrix Analysis and Applications*, 25, pp 128-142.

Castillo, J.E., & McGuinness, T. (2002). Steady state diffusion problems on non-trivial domains: Support operator method integrated with direct optimized grid generation, *Journal Applied Mathematics*, 40, 207-218.

Torres, C.R., & Castillo, J.E. (2002). A new 3d curvilinear coordinates numerical model for oceanic flow over arbitrary bathymetry (*In Spanish*). In *Desarrollos Recientes en Métodos Numéricos*, C. M. Muller-Karger, M. Lentini, M. Cerrolaza (Eds). MF, pp. 105-112.

Torres, C.R., Ochoa, J., Castillo, J.E., & Van Woert, M.L. (2002). Initial flow field of stratified flow pass an impulsive started sphere, *Journal Applied Numerical Mathematics*, 40/1-2 pp. 235-244.

- Bohner, M., & Castillo, J.E. (2001). Mimetic methods on measure chains, *Journal Computers and Mathematics Application*, 42, 705-710.
- Torres, C.R., Castillo, J.E., & Rangel, R.H. (2001, May 14-17). *Numerical Study of Stratified Flow Past a Sphere Inside a Cylinder*, V Latin American and Caribbean Congress on Fluid Mechanics, Caracas, Venezuela.
- Rangel, R.H., Trollinger, J.D., Coimbra, C.F.M., Castillo, J.E., & Torres, C. (2001, September 30-October 5). *Studies of Fundamental Particle Dynamics in Micro gravity*, in *Proceedings of the Micro gravity Transport Processes in Fluid, Thermal, Biological and Materials Science II*, Banff, Alberta, Canada.
- Castillo, J.E., Shashkov, M., Hyman, J.M., & Steinberg, S. (2001). Fourth and sixth-order conservative finite-difference approximations of the divergence and gradient, *Applied Numerical Mathematics*, 37, 171-187.
- Castillo, J.E., & Otto, J.S. (2000). Numerical techniques for the transformation to an orthogonal coordinate system aligned with a vector field, *Journal Computers and Mathematics Applications*, 40, 523-535.
- Torres-Navarrete, C.R., Hanazaki, H., Ochoa, J., Castillo, J.E., & Woert, M.V. (2000). Flow past a sphere moving vertically in a stratified diffusive fluid. *Journal of Fluid Mechanics*, 417, 211-236.
- Castillo, J.E., & Otto, J.S. (1999). A practical guide to planar grid generation, *Journal Computers and Mathematics Applications*, 37, 123-156.
- Torres, C.R., Ochoa, J., Castillo, J.E., & Hanazaki, H. (1999). Numerical simulation of the flow past a sphere in vertical motion within an stratified fluid, *Journal of Computational and Applied Mathematics*, Vol. 103, No. 1.
- Castillo, J.E., & Otto, J.S. (1997). *A generalized length strategy for direct optimization in planar grid generation*, Math. Comp. in Simulation 44, 441-456.
- Castillo, J.E., & Pedersen, E. (1996). Solution adaptive discrete variational grid generation for fluid flow calculations, *Journal of Computational and Applied Mathematics* 67, 343-370.
- Castillo, J.E., & Uson, F. (1996). *Adaptive algorithms on the physical grid*, Numerical Methods in Engineering Simulation, Cerrolaza, M., C. Gajardo, and C. Brebbia, eds.
- Torres-Navarrete, C.R., Ochoa, J., & Castillo, J.E. (1996). *A Numerical Experiment of the Flow Around a Sphere in Vertical Motion Within a Stratified Fluid*, Numerical Methods in Engineering Simulation. Cerrolaza, M., C. Gajardo, and C. Brebbia, eds. pp. 71-78.
- Castillo, J.E., Shashkov, M., Hyman, J.M., & Steinberg, S. (1995). The sensitivity and accuracy of fourth order finite-difference schemes on nonuniform grids in one dimension, *Journal Computers and Mathematics Applications*, Vol. 30, No. 8, pp. 41-55.
- Castillo, J.E., Shashkov, M., Hyman, J.M. & Steinberg, S. (1995). High-order mimetic finite-difference methods on nonuniform grids, *Houston Journal of Mathematics*, Special Edition ICOSAHOM 95.

- Castillo, J.E. (1994, July). *Direct Optimization Grid Generation Methods*, In proceedings of 14th IMACS World Congress on Computational and Applied Mathematics, Georgia Tech.
- Castillo, J.E., & Shashkov, M. (1994). *Grids Consistent with Finite Difference Schemes*, In “Numerical Grid Generation in Computational Fluid Dynamics and Related Fluids”, North Holland.
- Castillo, J.E., McEachern, M., Richardson, J., & Steinberg, S. (1994). *Modeling the Membrane Using Boundary-Fitted Coordinates*, Applied Mathematical Modeling, Vol. 18.
- Quisca, S.I., Castillo, J.E., & Aguirre, J. (1994, September). Adaptive Moving Mesh for Shallow Waters, *Latinoamerican Journal of Hydraulic*, No. 9, pp. 27-38.
- Castillo, J.E., & Richardson, J. (1993). *Parallel Solution of Elliptic Partial Differential Equations on Irregular Geometries*, In Proceedings of the sixth SIAM Conference on Parallel Processing for Scientific Computing.
- Castillo, J.E., McDermott, G., McEachern, M., & Richardson, J. (1992). *A Comparative Analysis of Numerical Techniques Applied to a Model of the Otolith Membrane*, *Journal Computers and Mathematics Applications*, Vol. 24, No. 7, pp. 133-141.
- Castillo, J.E. (1991). A discrete variational grid generation method, *SIAM Journal of Scientific and Statistical Computing*, Vol. 12, No. 2.
- Castillo, J.E. (1991). *The Discrete Variational Grid Generation Method on Curves and Surfaces*, In “Numerical Grid Generation in Computational Fluid Dynamics and Related Fluids”, North Holland.
- Castillo, J.E. (1991). An adaptive direct variational grid generation method, *Journal Computers and Mathematics Applications*, Vol. 4, No. 1.
- Castillo, J.E., & Gustafson, M. (1990). *Preconditioning a Large Scale Optimization Problem in Grid Generation*, In Proceedings of the IASTED International Symposium on Modeling, Simulation and Optimization, Montreal, Canada, May 22-24.
- Castillo, J.E., Steinberg, S., & Roache, P. (1988). *On the Folding of Numerically Generated Grids: Use of Reference Grids*, *Communications in Applied Numerical Methods*, Vol. 4, 471-481.
- Castillo, J.E. (1988). *A Direct Variational Grid Generation Method: Orthogonality Control*, In “Numerical Grid Generation and Fluid Mechanics '88”, Pineridge Press Limited, Swansea.
- Castillo, J.E., Steinberg, S. & Roache, P. (1988). Parameter estimation in variational grid generation, *Applied Math. and Comp.* Vol. 28, No. 2, p. 155.
- Castillo, J.E., Steinberg, S. & Roache, P. (1987). Mathematical aspects of variational grid generation II, *Journal of Computational and Applied Mathematics*, 20, 127-135.
- Castillo, J.E. (1987, June). A Direct Variational Grid Generation Method, In proceedings of 6th IMACS meeting, Lehigh University.
- Castillo, J.E. (1986). *Mathematical Aspects of Variational Grid Generation I*, In “Numerical Grid Generation in Computational Fluid Dynamics”, Pineridge Press Limited, Swansea.

Milfeld, K.F., Castillo, J.E., & Wyatt, R.E. (1985, August). Dynamics of eigenstate transitions induced by external fields: A new approach, *Journal of Chemical Physics*, 83(4).

Castillo, J.E. & Wyatt, R.E. (1985, May). Recursive residue generation method for laser-molecule interaction: Utilization of structured sparsity, *Journal of Computational Physics*, Vol. 59, No. 1.

Technical Reports:

Castillo, J.E., Shashkov, M., Hyman, J.M., & Steinberg, S. (1995). *High-Order Finite-Difference Methods on Nonuniform Grids*, Los Alamos National Laboratory, CNLS Report, LA-UR-95-583.

Castillo, J.E., & Otto, J.S.(1995). *On the Transformation to an Orthogonal Coordinate System Aligned with a Vector Field, Part Two: Variational Grid Generation*, CNLS Report, LA-UR-95-3407.

Castillo, J.E., Shashkov, M., Hyman, J.M., & Steinberg, S. (1994) *The Sensitivity and Accuracy of Fourth Order Finite-Difference Schemes on Nonuniform Grids in One Dimension*, Los Alamos National Laboratory, CNLS Report, LA-UR-94-3621.

Castillo, J.E., & Shashkov, M. (1993). *Grid Generation Methods Consistent with Finite-Difference Schemes*, Los Alamos National Laboratory, CNLS Report, LA-UR-93-2932.

Castillo, J.E., Steinberg, S., & Roache, P. (1987). *On the Folding of Numerically Generated Grids*, Technical Report No. 2, Institute for Computational Research, Department of Mathematics and Statistics University of New Mexico, Albuquerque, NM.

PROFESSIONAL PRESENTATIONS

Castillo, J.E. (1996). *Adaptive Direct Optimization Grid Generation Methods*, SIAM Annual Meeting, Kansas City.

Castillo, J.E. (1994). *Direct Optimization Grid Generation Methods*, SIAM Annual Meeting, San Diego, CA.

Castillo, J.E. (1991, July). *The Discrete Grid Generation Method on Curves and Surfaces*, mini symposium ICIAM meeting, Washington D.C.

Castillo, J.E. (1991, June). *The Discrete Grid Generation Method on Curves and Surfaces*, International Conference, Numerical Grid Generation in Computational Fluid Dynamics, Barcelona, Spain.

Castillo, J.E. (1990, July). *Discrete Grid Generation on Curves*. Contributed paper presented at the SIAM meeting, Chicago, IL.

Castillo, J.E. (1990, April). *Discrete Variational Grid Generation*. Contributed paper presented to the American Mathematical Society.

Castillo, J.E., & Hansen, L.K. (1989, July). *Adaptive Grids for Surface Interpolation*. Contributed paper presented at the SIAM Meeting, San Diego, CA.

Castillo, J.E. (1988, July). *The Volume Integral in Variational Grid Generation*, mini symposia at the SIAM Conference at Minneapolis, Minnesota.

Barrera-Sanchez, P., & Castillo, J.E. (1987, May). *A Large-scale Non-Linear Optimization Problem Arising From Grid Generation I*. Contributed paper presented at the SIAM conference in Optimization at Houston, TX.

Barrera-Sanchez, P., & Castillo, J.E. (1987, October). *A Large-scale Non-Linear Optimization Problem Arising From Grid Generation II*. Contributed paper presented at the SIAM Conference at Denver, Colorado.

Castillo, J.E. (1986, March). *Folding of Numerical Grids: Use of Reference Grids*. Conference presented at the ACM Rio Grande Chapter SIGNUM Meeting. Albuquerque, NM.

Castillo, J.E., Steinberg, S., & Roache, P. (1986, June). *On the Folding of Numerically Generated Grids: Use of Reference Grids*. Contributed paper presented at 10th U.S. National Congress of Applied Mechanics, Austin, TX.

Castillo, J.E. (1986, July). *Mathematical Aspects of Variational Grid Generation I*. Contributed paper presented at the International Conference, Numerical Grid Generation in Computational Fluid Dynamics, Landshut, W. Germany.

Castillo, J.E., Steinberg, S., & Roache, P. (1986, July). *Mathematical Aspects of Variational Grid Generation II*. Contributed paper presented at the International Congress on Computational and Applied Mathematics, University of Leuven, Belgium.

Castillo, J.E. (1986, December). *A Large-scale Non-Linear Optimization Problem Arising From Grid Generation*. Conference presented at the ACM Rio Grande Chapter SIGNUM Meeting. Albuquerque, New Mexico.

Castillo, J.E., Steinberg, S., & Roache, P. (1985). *On Folding of Numerical Grids*. Paper presented at SIAM Fall Meeting, Tempe, Arizona.

INVITED PRESENTATIONS

“On the Solvability of the Castillo-Grone Mimetic Discretization,” International Conference in Numerical Analysis and Applied Mathematics 2005, Rhodes, Greece, September 16-22, 2005.

“High Order Mimetic Differential Operators,: First International Workshop on Dynamic Equations on Time Scales, University of Bahçeşehir, Istanbul, Turkey, June 27-July 1, 2005.

“Mimetic Discretization of Continuum Mechanics,” 37th National Congress of the Mexican Mathematical Society, Ensenada, Baja California, Mexico, October 10-15, 2004.

“High Order Mimetic Discretizations,” Second Venezuelan Workshop on Mimetic Discretizations, Universidad de Carabobo, Valencia, Venezuela, April 13-15, 2004.

“Numerical Solutions of Partial Differential Equations,” 36th National Congress of the Mexican Mathematical Society, Pachuca, Mexico, October 12-17, 2003.

“High Order Mimetic Schemes Including Boundary Conditions,” IV Pan-American Workshop in Applied and Computational Mathematics, Universidad de Cordoba, Argentina, July 5, 2002.

“High Order Mimetic Differential Operators on Nonuniform Grids,” Stanford, Scientific Computing Seminar, October 19, 1998.

“High Order Mimetic Differential Operators,” UCSD Numerical Analysis Seminar, October 6, 1998.

“High Order Mimetic Differential,” Center for Nonlinear Studies Seminar, Los Alamos National Laboratory, March 1998.

“Direct Optimization Grid Generation Methods,” Second Pan-American Workshop in Applied and Computational Mathematics, Gramado, Brazil, 1997.

“Numerical Solutions of Partial Differential Equations,” International Conference on Numerical Methods in Engineering, Merida, Venezuela, 1996.

“Grid Generation and Numerical Solutions to Partial Differential Equations, Seminar,” Center for Nonlinear Studies, Los Alamos National Laboratory, July 1993.

“Grid Generation and Large Scale Optimization, Colloquium,” Rice University, November 1991.

“Adaptive Grids for Surface Interpolations and Visualization,” Seminar, NOSC, San Diego, CA, November 1991.

“Automatic Grid Generation, Colloquium,” University of Essen, Germany, June 1991.

“Numerical Grids for Solving Partial Differential Equations,” Howard University, March 1991.

“Grid Generation and Large Scale Optimization,” National Institute of Standards and Technology (NIST), March 1991.

“The Interdisciplinary Research Center at San Diego State University,” NOSC, San Diego, CA, February 1991.

“Numerical Solutions of Partial Differential Equations on Irregular Regions,” NOSC, San Diego, CA, October 1990.

“Numerical Grids for Solving Partial Differential Equations,” University of Southern California, November 8, 1989.

PRINCIPAL INVESTIGATOR/CO-INVESTIGATOR-FUNDED RESEARCH GRANTS

“Training for a New Interdisciplinary Research Workforce,” National Institutes of Health/NIDDK 1T90 DKO70115-01, 2004-2009.

“Producing Scientific Professionals: Developing and Enhancing Professional Master of Science Degrees at San Diego State University,” The Alfred P. Sloan Foundation, 2001-2002.

“Numerical Solutions of Elliptic Partial Differential Equations on Irregular Regions, Parallel Aspects of Grid Generation,” San Diego State University Research, Scholarship, and Creative Activity Program, 1993-1996.

“Combat Modeling and Optimization,” ARO Research Grant, (with D. Lutz), 1992-1993.

“Extending the Capabilities of Emulation of Soviet Mathematical Models of Combat,” U.S. Army Research Contract, (with D. Lutz), 1990-1991.

“An Analysis of the Chuyev Model for Combat in One Spatial Dimension,” U.S. Army Research Contract, (with D. Lutz), 1989-1990.

“Solving Large Scale Minimization Problems in Grid Generation,” San Diego State University Faculty Development Program, 1989-1990.

“Numerical Solutions of Elliptic Partial Differential Equations on Irregular Regions,” San Diego State University Research, Scholarship, and Creative Activity Program, 1989-1990.

“Discrete Variational Grid Generation: Orthogonality Control,” San Diego State University Faculty Development Program, 1987-1988.

PRINCIPAL INVESTIGATOR-INTERNATIONAL PROGRAMS GRANTS

“Fifth Pan-American Workshop on Applied and Computational Mathematics,” National Science Foundation, Tegucigalpa, Honduras, 2004.

“II Pan-American Advanced Studies Institute,” National Science Foundation Award, 2004.

“I Pan-American Advanced Studies Institute,” National Science Foundation Award, 2002.

“Fourth Pan-American Workshop on Applied and Computational Mathematics,” National Science Foundation, Cordoba, Argentina, 2002.

“Third Pan-American Workshop on Computational and Applied Mathematics,” National Science Foundation Award, Trujillo, Peru, 2000.

”Second Pan-American Workshop on Computational Science and Applied Mathematics,” National Science Foundation Award, Gramado, Brazil, 1997

“First Pan-American Workshop on Computational and Applied Mathematics,” National Science Foundation Award, Caracas, Venezuela, 1993.

MASTERS DEGREE THESES/RESEARCH PROJECTS CHAIRED

Terrence McGuinness, (Computational Science): Integrating the Support Operator Method with Direct Grid Optimization, Graduated Fall 2000.

Sharon Won (CS): Grids and Image Processing, Spring 1997.

Johnatan Richarson (AM): Generating textures by solving reaction-diffusion type equations using direct optimization grid generation methods, Spring 1997.

Marc McEachern, (Computer Science): Solution Adaptive Discrete Variational Grid Generation Algorithms, Graduated Spring 1993.

Erik Pedersen, (AE): Solution Adaptive Discrete Variational Grid Generation for Fluid Flow Calculations, Graduated Fall 1993.

Daria Bounassissi, (AM): Geometry Adaption and Parameter Estimation for Discrete Variational Grid Generation, Graduated Fall 1992.

Hsiufang Chen (CS): Truncated Newton's Methods in Grid Generation, Graduated August 1991.

Lynne Tablewski (AM): Grid Generation for Elliptic Problems, Graduated August 1990.

Marjaneh Gustafson (CS): On Preconditioning Grid Generation, Graduated November 1989.

Brian Nguyen (AE): 3-Dimensional Unstructured Grids, project finished December 1989.

INTERNATIONAL DOCTORAL DEGREES CHAIRED

Carlos Torres, (CICESE, Ensenada, Mexico). Numerical Solutions of Stratified Flow Pass a Cylinder, Spring 1997.

SYNERGISTIC ACTIVITIES

- Director of the Computational Science Research Center, College of Sciences, SDSU.
- Founder of the SDSU Applied Computational Science and Engineering Student Support Program (ACSESS), March 2004.
- Responsible for the organization efforts and implementation of the PhD Program in Computational Science offered jointly with Claremont Graduate University, and the first of its kind in California.
- Chair, Joint Doctoral Program in Computational Science, SDSU and Claremont Graduate University.
- Honored as one of the "25 Most Influential SDSU People in 2003."
- Professor of Mathematics, SDSU. Specialist on direct variational grid generation, the applications of these methods, and the implementation of these techniques to fluid-flow problems and problems in biology. Conducts work in high-order mimetic finite-difference schemes, sensitivity of finite difference schemes to grid qualities and, parallel algorithms for elliptic problems. Current work consists of combining direct-optimization grid-generation methods with multigrid techniques.
- Affiliate, Los Alamos National Laboratory, project collaborator on high-order mimetic finite-difference methods on non-uniform grids.
- Chair, First Panamerican Advanced Studies Institute in Computational Science and Engineering held in Cordoba, Argentina, June-July 2002 (Funded by NSF and DOE).
- Chair, Second Panamerican Advanced Studies Institute in Computational Science and Engineering held in Tegucigalpa, Honduras, June-July 2004 (Funded by NSF and DOE).
- Chair of the Panamerican Workshops held in Caracas, Venezuela; Gramado, Brazil; Trujillo, Peru; Cordoba, Argentina; and Tegucigalpa, Honduras.