

Curriculum Vitae of Albert A. Groenwold (as on March 1, 2018)

CONTACT INFORMATION	<i>Address:</i>	Department of Mechanical and Mechatronic Engineering University of Stellenbosch Private Bag X1 Matieland 7602 South Africa
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PERSONAL DETAILS	<i>Gender:</i>	Male
	<i>Date of birth:</i>	October 10, 1962
	<i>Place of birth:</i>	Arnhem, the Netherlands
EDUCATION	<i>Ph.D.</i>	
	- <i>Institution:</i>	University of Pretoria, 1998
	- <i>Field of study:</i>	Mechanical Engineering
	- <i>Dissertation title:</i>	Global and Discrete Programming Problems in Structural Optimization
	- <i>Promotor:</i>	Prof. Dr. Nielen Stander
	- <i>Examiners:</i>	Prof. Dr. Raphael T. Haftka (University of Florida, Gainesville, Florida, U.S.A.) Prof. Dr. Jasbir S. Arora (University of Iowa, Iowa City, Iowa, U.S.A.)
	<i>M.Eng. (Cum Laude)</i>	
	- <i>Institution:</i>	University of Pretoria, 1994
	- <i>Field of study:</i>	Mechanical Engineering
	- <i>Thesis title:</i>	Finite Element Analysis of Composite Plates and Shells
	- <i>Supervisor:</i>	Prof. Dr. Nielen Stander
	- <i>Examiner:</i>	Prof. Dr. Edward L. Wilson (University of California, Berkeley, Calif., U.S.A.)
	<i>B.Eng.</i>	
	- <i>Institution:</i>	University of Pretoria, 1988
	- <i>Field of study:</i>	Mechanical Engineering
CURRENT POSITION		Professor in the Department of Mechanical and Mechatronic Engineering at the University of Stellenbosch.
RESEARCH INTERESTS		<p><i>My broad, long term</i> research interests include high performance computing, green or energy efficient computing, sequential approximate optimization, structural optimization (including topology optimization), metaheuristics, finite element technology, composite materials, and environmental and sustainability modeling. Since more recently, I am also interested in multidisciplinary optimization (MDO) and in particular simultaneous analysis and design (SAND).</p> <p><i>My most active, current</i> research topics include the development of algorithms for very large scale optimal design, approximation concepts, massively parallel processing, local stress constraints (including composite materials) using SAND, and optimal lay-out problems for environmental and sustainability modeling (wind and solar).</p>
COURSES TAUGHT		<ul style="list-style-type: none">• Optimization (classical & gradient-free): post-graduate level only.• Finite Elements: both under- and post-graduate level.• Fracture Mechanics: both under- and post-graduate level.• Composite Materials: both under- and post-graduate level.• Structural Mechanics / Strength of Materials: both under- and post-graduate level.

EMPLOYMENT

- *January 2007 - Present:* Professor, Structural Mechanics Division, Dept. of Mechanical Engineering, University of Stellenbosch.
- *January 2006 - December 2006:* Associate Professor, Structural Mechanics Division, Dept. of Mechanical Engineering, University of Stellenbosch.
- *January 2001 - December 2005:* Associate Professor, Division of Structural Mechanics, Dept. of Mechanical Engineering, University of Pretoria.
- *January 1998 - December 2000:* Senior lecturer, Division of Structural Mechanics, Dept. of Mechanical Engineering, University of Pretoria.
- *June 1997 - December 1997:* Researcher, Dept. of Mechanical Engineering, Technikon Northern Gauteng.
- *September 1996 - May 1997:* Consultant for Denel Aviation, Rooivalk Stress Office.
- *April 1993 - August 1996:* Graduate research assistant, Division of Structural Mechanics, Dept. of Mechanical Engineering, University of Pretoria. (Includes an extended visit to the Department of Aerospace Engineering, Mechanics and Engineering Science, University of Florida, Gainesville, FL., U.S.A.)
- *February 1992 - March 1993:* Engineer, ESKOM Technology, Research & Investigations.
- *February 1991 - January 1992:* Graduate research assistant, Division of Structural Mechanics, Dept. of Mechanical Engineering, University of Pretoria.
- *January 1990 - January 1991:* Engineer, ESKOM Technology, Research & Investigations.
- *January 1989 - December 1989:* Assistant engineer, ESKOM Technology, Research & Investigations.
- *January 1988 - December 1988:* Engineer-in-training, ESKOM Tutuka Power Station.

REVIEWER IN RECENT YEARS FOR

- Structural and Multidisciplinary Optimization
- International Journal for Numerical Methods in Engineering
- Computers and Structures
- Finite Elements in Analysis and Design
- Computer Methods in Applied Mechanics and Engineering
- Optimization and Engineering
- International Journal on Computers, Systems and Signals
- Thin Walled Structures
- Journal of Global Optimization
- Journal of Optimization: Theory and Applications
- Applied Mathematical Modeling
- International Transactions in Operational Research
- Journal of Mechanics of Materials and Structures
- International Journal of Systems Science
- Journal of Engineering, Design and Technology

GUEST RESEARCHER

- September 2001: Guest researcher, Department of Materials Handling, University of Miskolc, Hungary, on invitation by Prof. Karoly Jármai and Prof. Jozseph Farkas.
- September 2002: Guest researcher, Department of Materials Handling, University of Miskolc, Hungary, on invitation by Prof. Jozseph Farkas.
- April 2004 - October 2004: Visiting Professor, Technical University of Eindhoven, Netherlands, as guest of Prof Koos Rooda, Prof Henk Nijmeijer, and Dr Pascal Etman.
- October 2008 - November 2008: Visiting Professor, Technical University of Eindhoven, Netherlands, as guest of Prof Koos Rooda and Dr Pascal Etman.

OTHER (Research related)

- Member of the editorial board of the journal *Structural and Multidisciplinary Optimization* (SMO).
- H-index of 23; i10 index of 43; 2277 citations, 965 since 2013 (statistics from Google Scholar as on March 1, 2018).
- Received the Excellence Award for Technical Innovation in 2003 from the Department of Science and Technology (DST), South Africa (read: compliments my students.) :-)
- Member of the scientific and advisory boards of numerous international conferences.
- Invited lecturer at the South African National Festival of Science, Engineering and Technology in Grahamstown, March 17 - 23, 2004. (The first time ever that an engineer was invited.)
- Hosted Prof L.F.P. Etman from the Technical University of Eindhoven in the Netherlands a number of times.
- Host to Prof M.J.D. Powell from the Department of Applied Mathematics at the University of Cambridge during October and November 2012.

OTHER (Professional, administration & general)

- Graduate coordinator, Department of Mechanical and Mechatronic Engineering, University of Stellenbosch.
- Member of the Research Advisory Board of the Faculty of Engineering.
- Member of the Senate Subcommittee for Research in Science, Mathematics and Engineering.
- Registered as a Professional Engineer with ECSA since May 1999.
- Obtained the highest lecturer rating in Mechanical Engineering in 2000 at the University of Pretoria. (Sadly, this feat I managed only once.) :-)
- Member of SAIMEchE.
- I am pretty fluent in Afrikaans, English and Dutch.

INTERNATIONAL JOURNAL PUBLICATIONS

- A1. A.A. Groenwold and N. Stander. An efficient 4-node 24 d.o.f. thick shell finite element with 5-point quadrature. *Eng. Comput.*, 12:723–748, 1995.
- A2. A.A. Groenwold, N. Stander, and J.A. Snyman. A pseudo-discrete rounding method for structural optimization. *Struct. Opt.*, 11:218–227, 1996.
- A3. A.A. Groenwold, J.A. Snyman, and N. Stander. Modified trajectory method for practical global optimization problems. *AIAA J.*, 34:2126–2131, 1996.
- A4. A.A. Groenwold and N. Stander. Optimal discrete sizing of truss structures subject to buckling constraints. *Struct. Opt.*, 14:71–80, 1997.
- A5. A.A. Groenwold and N. Stander. A 24 d.o.f. 4-node flat shell finite element for general unsymmetric orthotropic layered composites. *Eng. Comput.*, 15:518–543, 1998.
- A6. A.A. Groenwold, N. Stander, and J.A. Snyman. A regional genetic algorithm for the discrete optimal design of truss structures. *Int. J. Numer. Meth. Eng.*, 44:749–766, 1999.
- A7. S. Geyer and A.A. Groenwold. Two hybrid stress membrane finite element families with drilling rotations. *Int. J. Numer. Meth. Eng.*, 53:583–601, 2002.
- A8. P.C. Fourie and A.A. Groenwold. The particle swarm optimization algorithm in size and shape optimization. *Struct. Multidisc. Opt.*, 23:259–267, 2002.
- A9. A.A. Groenwold and J.A. Snyman. Global optimization using dynamic search trajectories. *J. Global Opt.*, 24:51–60, 2002.
- A10. A.A. Groenwold and M.P. Hindley. Competing parallel algorithms in structural optimization. *Struct. Multidisc. Opt.*, 24:343–350, 2002.
- A11. S. Geyer and A.A. Groenwold. On reduced integration and locking of flat shell finite elements with drilling rotations. *Commun. Numer. Meth. Eng.*, 19:85–97, 2003.
- A12. H.P.J. Bolton, G. Heymann, and A.A. Groenwold. Global search for critical failure surface in slope stability analysis. *Eng. Opt.*, 35:51–65, 2003.

- A13. C.S. Long, J.A. Snyman, and A.A. Groenwold. Optimal structural design of a planar parallel platform for machining. *Appl. Math. Model.*, 27:581–609, 2003.
- A14. J.F. Schutte and A.A. Groenwold. Sizing design of truss structures using particle swarms. *Struct. Multidisc. Opt.*, 25:261–269, 2003.
- A15. A.A. Groenwold, Q.Z. Xiao, and N.J. Theron. Accurate solution of traction free boundaries using hybrid stress membrane elements with drilling degrees of freedom. *Comput. Struct.*, 82:2071–2081, 2004.
- A16. Gy. Kovács, A.A. Groenwold, K. Jármai, and J. Farkas. Analysis and optimum design of fiber reinforced composite structures. *Struct. Multidisc. Opt.*, 28:170–179, 2004.
- A17. C.S. Long and A.A. Groenwold. Reduced modified quadrature for quadratic membrane finite elements. *Int. J. Numer. Meth. Eng.*, 61:837–855, 2004.
- A18. H.P.J. Bolton, A.A. Groenwold, and J.A. Snyman. The application of a unified Bayesian stopping criterion in competing parallel algorithms for global optimization. *Comput. Math. Appl.*, 48:549–560, 2004.
- A19. J.F. Schutte and A.A. Groenwold. A study of global optimization using particle swarms. *J. Global Opt.*, 31:93–108, 2005.
- A20. A. Viljoen, A.G. Visser, and A.A. Groenwold. Computationally efficient analysis and optimization of stiffened thin walled panels in shear. *AIAA J. Aircraft*, 42:743–747, 2005.
- A21. D.N. Wilke, S. Kok, and A.A. Groenwold. A quadratically convergent unstructured remeshing strategy for shape optimisation. *Int. J. Numer. Meth. Eng.*, 65:1–17, 2006.
- A22. C.S. Long, S. Geyer, and A.A. Groenwold. A numerical study of the effect of penalty parameters for membrane elements with independent rotation fields and penalized equilibrium. *Finite Elem. Anal. Design*, 42:757–765, 2006.
- A23. C.S. Long, P.W. Loveday, and A.A. Groenwold. Planar four node piezoelectric elements with drilling degrees of freedom. *Int. J. Numer. Meth. Eng.*, 65:1802–1830, 2006.
- A24. A.A. Groenwold and R.T. Haftka. Optimization with non-homogeneous failure criteria like Tsai-Wu for composite laminates. *Struct. Multidisc. Opt.*, 32:183–190, 2006.
- A25. D.N. Wilke, S. Kok, and A.A. Groenwold. Comparison of linear and classical velocity update rules in particle swarm optimization: notes on diversity. *Int. J. Numer. Meth. Eng.*, 70:962–984, 2007.
- A26. D.N. Wilke, S. Kok, and A.A. Groenwold. Comparison of linear and classical velocity update rules in particle swarm optimization: notes on scale and frame invariance. *Int. J. Numer. Meth. Eng.*, 70:985–1008, 2007.
- A27. A.A. Groenwold, L.F.P. Etman, J.A. Snyman, and J.E. Rooda. Incomplete series expansion for function approximation. *Struct. Multidisc. Opt.*, 34:21–40, 2007.
- A28. D.W. Wood, Z.C. Lai, C.S. Long, S. Kok, and A.A. Groenwold. Semi-analytical elements for radially symmetric problems. *Comput. Struct.*, 85:1445–1452, 2007.
- A29. A.A. Groenwold and L.F.P. Etman. On the equivalence of optimality criterion methods and sequential approximate optimization in the classical topology layout problem. *Int. J. Numer. Meth. Eng.*, 73:297–316, 2008.
- A30. A. de Klerk, A.G. Visser, and A.A. Groenwold. Lower and upper bound estimation of isotropic and orthotropic fracture mechanics problems using elements with rotational degrees of freedom. *Commun. Numer. Meth. Eng.*, 24:335–353, 2008.
- A31. A.A. Groenwold and L.F.P. Etman. Sequential approximate optimization using dual sub-problems based on incomplete series expansions. *Struct. Multidisc. Opt.*, 36:547–570, 2008.
- A32. C.S. Long, P.W. Loveday, and A.A. Groenwold. Axisymmetric solid-of-revolution finite elements with rotational degrees of freedom. *Finite Elem. Anal. Design*, 45:121–131, 2009.
- A33. R.K. Brouwer and A.A. Groenwold. Fuzzy relational clustering based on comparing two proximity matrices with utilization of particle swarm optimization. *Soft Computing*, 13:577–589, 2009.

- A34. A.A. Groenwold, L.F.P. Etman, S. Kok, D.W. Wood, and S. Tosserams. An augmented Lagrangian approach to non-convex SAO using diagonal quadratic approximations. *Struct. Multidisc. Opt.*, 38:415–421, 2009.
- A35. A.A. Groenwold and L.F.P. Etman. A simple heuristic for gray-scale suppression in optimality criterion-based topology optimization. *Struct. Multidisc. Opt.*, 39:217–225, 2009.
- A36. C.S. Long, P.W. Loveday, and A.A. Groenwold. Effects of finite element formulation on optimal plate and shell structural topologies. *Finite Elem. Anal. Design*, 45:817–825, 2009.
- A37. C.S. Long, P.W. Loveday, and A.A. Groenwold. Effects of planar element formulation and numerical integration order on checkerboard material layouts. *Struct. Multidisc. Opt.*, 39:487–501, 2009.
- A38. A.A. Groenwold, D.W. Wood, L.F.P. Etman, and S. Tosserams. Globally convergent optimization algorithm using conservative convex separable diagonal quadratic approximations. *AIAA J.*, 47:2649–2657, 2009.
- A39. D.W. Wood and A.A. Groenwold. Non-convex dual forms based on exponential intervening variables, with application to weight minimization. *Int. J. Numer. Meth. Eng.*, 80:1544–1572, 2009.
- A40. D.N. Wilke, S. Kok, and A.A. Groenwold. The application of gradient-only optimization methods for problems discretized using non-constant methods. *Struct. Mult. Optim.*, 40:433–451, 2010.
- A41. A.A. Groenwold, L.F.P. Etman, and D.W. Wood. Approximated approximations for SAO. *Struct. Mult. Optim.*, 41:39–56, 2010.
- A42. A.A. Groenwold and L.F.P. Etman. A quadratic approximation for structural topology optimization. *Int. J. Numer. Meth. Eng.*, 82:505–524, 2010.
- A43. R.K. Brouwer and A.A. Groenwold. Modified fuzzy c-means for ordinal valued attributes with particle swarm optimization. *Fuzzy Sets and Systems*, 161:1774–1789, 2010.
- A44. D.W. Wood and A.A. Groenwold. On concave constraint functions and duality in predominantly black-and-white topology optimization. *Comp. Meth. Appl. Mech. Eng.*, 199:2224–2234, 2010.
- A45. A.A. Groenwold and L.F.P. Etman. On the conditional acceptance of iterates in SAO algorithms based on convex separable approximations. *Struct. Mult. Optim.*, 42:165–178, 2010.
- A46. M.P. Hindley, M.N. Mitchell, D.C. Blaine, and A.A. Groenwold. Observations in the statistical analysis of NBG-18 nuclear graphite strength tests. *J. Nucl. Mater.*, 420:110–115, 2012.
- A47. L.F.P. Etman, A.A. Groenwold, and J.E. Rooda. First-order sequential convex programming using approximate diagonal QP subproblems. *Struct. Mult. Optim.*, 45:479–488, 2012.
- A48. A.A. Groenwold. On the linearization of separable quadratic constraints in dual sequential convex programs. *Comput. Struct.*, 102:42–48, 2012.
- A49. D.W. Wood and A.A. Groenwold. On convex transformability and the solution of nonconvex problems via the dual of Falk. *Struct. Mult. Optim.*, 46:171–185, 2012.
- A50. A.A. Groenwold. Positive definite separable quadratic programs for non-convex problems. *Struct. Mult. Optim.*, 46:795–802, 2012.
- A51. P.J. Janse van Rensburg, A.A. Groenwold, and D.W. Wood. Optimization of cylindrical composite flywheel rotors for energy storage. *Struct. Mult. Optim.*, 47:135–147, 2013.
- A52. D.N. Wilke, S. Kok, and A.A. Groenwold. Relaxed error control in shape optimization that utilizes remeshing. *Int. J. Numer. Meth. Eng.*, 94:273–289, 2013.
- A53. M.P. Hindley, M.N. Mitchell, C. Erasmus, R. McMurtry, T.H. Becker, D.C. Blaine, and A.A. Groenwold. A numerical stress based approach for predicting failure in NBG-18 nuclear graphite components with verification problems. *J. Nucl. Mater.*, 436:175–184, 2013.
- A54. D.N. Wilke, S. Kok, J.A. Snyman, and A.A. Groenwold. Gradient-only approaches to avoid spurious local minima in unconstrained optimization. *Optim. Eng.*, 14: 275–304, 2013.

- A55. M.P. Hindley, A.A. Groenwold, D.C. Blaine, and T.H. Becker. Optimisation of the link volume for weakest link failure prediction in NBG-18 nuclear graphite. *Nucl. Eng. Design*, 274: 10–19, 2014.
- A56. S. Park, S.H. Jeong, G.H. Yoon, A.A. Groenwold, and D.H. Choi. A globally convergent sequential convex programming using an enhanced two-point diagonal quadratic approximation for structural optimization. *Struct. Mult. Optim.*, 50: 739–753, 2014.
- A57. S.L. Lutchman, A.A. Groenwold, P. Gauché, and S. Bode. On using a gradient-based method for heliostat field layout optimization. *Energy Proc.*, 49: 1429–1438, 2014.
- A58. M.N. Ras, D.N. Wilke, A.A. Groenwold, and S. Kok. On rotationally invariant continuous-parameter genetic algorithms. *Adv. Eng. Soft.*, 49: 1429–1438, 2014.
- A59. M.P. Hindley, A.A. Groenwold, D.C. Blaine, and T.H. Becker. Failure prediction of full-size reactor components from tensile specimen data on NBG-18 nuclear graphite. *Nucl. Eng. Design*, 284: 1–9, 2015.
- A60. D.P. Munro, A.A. Groenwold. On sequential approximate simultaneous analysis and design in classical topology optimization. *Int. J. Numer. Meth. Eng.*, 110: 227–247, 2017.
- A61. D.P. Munro, A.A. Groenwold. Local stress-constrained and slope-constrained SAND topology optimisation. *Int. J. Numer. Meth. Eng.*, 110: 420–439, 2017.
- A62. D.P. Munro, A.A. Groenwold. On design-set restriction in SAND topology optimization *Struct. Multidisc. Optim.* Available from Online-first, DOI 10.1007/s00158-017-1827-9, 2017.

LOCAL JOURNAL PUBLICATIONS

- B1. S. Kok, D.W. Wood, and A.A. Groenwold. A particle swarm minimization algorithm with enhanced hill climbing capability. *S.A. J. Science*, 102: 543–547, 2006.

CHAPTERS IN BOOKS

- C1. H.P.J. Bolton, J.F. Schutte, and A.A. Groenwold. Multiple parallel local searches in global optimization. In J. Dongarra, P. Kacsuk, and N. Podhorszki, editors, *Recent advances in parallel virtual machine and message passing interface*, number 1908 in Lecture notes in computer science, pages 88–95, Springer, Sept. 2000. ISBN 978-3-540-41010-2.
- C2. A.A. Groenwold and J.A. Snyman. Global optimization using dynamic search trajectories. In P.M. Pardalos, M. Athanasios, and R.E. Burkard, editors, *Combinatorial and Global Optimization*, volume 14 of *Series on Applied Mathematics*, pages 123–132. World Scientific Publishing Co., Singapore, 2002. ISBN 978-9-810-24802-4.
- C3. J.A. Snyman, H.P.J. Bolton, and A.A. Groenwold. A multi-start methodology for global optimization using novel constrained local optimizers. In C.A. Floudas and P.M. Pardalos, editors, *Frontiers In Global Optimization*, volume 74 of *Nonconvex Optimization and It's Applications*, pages 499–516. Kluwer Academic Publishers, 2004. ISBN 978-1-402-07699-2.

INTERNATIONAL CONFERENCES

- D1. A.A. Groenwold, J.A. Snyman, and N. Stander. Global unconstrained optimization of composite shell structures. In *Proc. 36th AIAA/ASME/ASCE/AHS/ASC Structures, Dynamics and Materials Conference*, New Orleans, LA, U.S.A., April 1995. Paper 95-1336.
- D2. A.A. Groenwold, N. Stander, and J.A. Snyman. Discrete structural optimization through selective dynamic rounding. In N. Olhoff and G.I.N. Rozvany, editors, *Proc. First World Congress on Structural and Multidisciplinary Optimization*, pages 921–926, Goslar, Germany, May 1995.
- D3. A.A. Groenwold and J.A. Snyman. Global optimization using dynamic search trajectories. In *Proc. of the Conference on Combinatorial and Global Optimization*, Chania, Crete, May 1998.
- D4. A.A. Groenwold and J.A. Snyman. Filled functions in the global optimization of composite structures. In *Proc. Third World Congress on Structural and Multidisciplinary Optimization*, Niagara Falls, N.Y., U.S.A., May 1999. Paper 49-EGO2-2.

- D5. J.F. Schutte, H.P.J. Bolton, C. Erasmus, S. Geyer, and A.A. Groenwold. An efficient parallel global optimization infrastructure for composite structures. In G. De Roeck and B.H.V. Topping, editors, *Proc. Fifth International Conference on Computational Structures Technology, Identification, Control and Optimization of Engineering Structures*, pages 161–168, Leuven, Belgium, Sept. 2000.
- D6. S. Geyer and A.A. Groenwold. A new 24 d.o.f. assumed stress finite element for orthotropic shells. In A. Zingoni, editor, *Proc. Structural Engineering, Mechanics and Computation*, pages 647–654, Cape Town, South Africa, April 2001. Elsevier Science Ltd.
- D7. A.A. Groenwold and M.P. Hindley. Competing parallel algorithms in structural optimization. In *Proc. Fourth World Congress on Structural and Multidisciplinary Optimization*, Dalian, China, May 2001. Paper 148.
- D8. Gy. Kovács, A.A. Groenwold, K. Jármai, and J. Farkas. Analysis and optimum design of fiber reinforced composite structures. In *Proc. Fourth World Congress on Structural and Multidisciplinary Optimization*, Dalian, China, May 2001. Paper 151.
- D9. P.C. Fourie and A.A. Groenwold. The particle swarm algorithm in topology optimization. In *Proc. Fourth World Congress on Structural and Multidisciplinary Optimization*, Dalian, China, May 2001. Paper 154.
- D10. A. Viljoen, A.G. Visser, and A.A. Groenwold. Optimum design of stiffened shear panels. In *Proc. Fourth World Congress on Structural and Multidisciplinary Optimization*, Dalian, China, May 2001. Paper 165.
- D11. M.P. Hindley and A.A. Groenwold. Machine learning, distributed computing and cellular automata in structural optimization. In *Proc. Fourth World Congress on Structural and Multidisciplinary Optimization*, Dalian, China, May 2001. Paper 166.
- D12. R.J. Huyssen and A.A. Groenwold. On tailless flight: lessons learned from the Exulans glider project. In *Proc. 27th Organisation Scientifique et Technique du Vol à Voile (OSTIV) Congress*, Mbabatho, South Africa, December 2001.
- D13. S. Geyer and A.A. Groenwold. On low order finite elements for the analysis of orthotropic structures. In *Proc. 23rd International SAMPE European Conference*, Society for the Advancement of Materials and Process Engineering, pages 337–348, Paris Expo, Port de Versailles, April 2002.
- D14. J.F. Schutte and A.A. Groenwold. The optimal sizing design of truss structures using the particle swarm optimization algorithm. In *Proc. 9th AIAA/ISSMO Symposium on Multidisciplinary Analysis and Optimization*, Atlanta, Georgia, U.S.A., September 2002.
- D15. A.A. Groenwold, Q.Z. Xiao, and N.J. Theron. Representing traction free boundaries using drilling degrees of freedom. In B.H.V. Topping and Z. Bittnar, editors, *Proc. Sixth International Conference on Computational Structures Technology*, Prague, Czech Republic, Sept. 2002. Paper 22.
- D16. D.N. Wilke, J.F. Schutte, and A.A. Groenwold. Constrained particle swarm searches in the optimal sizing design of truss structures. In K. Jármai and J. Farkas, editors, *Proc. Int. Conf. on Metal Structures: Design, Manufacture, Economy*, pages 301–308, Miskolc, Hungary, April 2003. Millpress, Rotterdam, the Netherlands.
- D17. C.S. Long, J.A. Snyman, and A.A. Groenwold. Practicable accuracy of minimum weight designs of a planar machining platform. In K. Jármai and J. Farkas, editors, *Proc. Int. Conf. on Metal Structures: Design, Manufacture, Economy*, pages 277–286, Miskolc, Hungary, April 2003. Millpress, Rotterdam, the Netherlands.
- D18. C.S. Long, P.W. Loveday, and A.A. Groenwold. On membrane elements with drilling degrees of freedom in topology optimization. In *Proc. Fifth World Congress on Structural and Multidisciplinary Optimization*, Lido di Jesolo, Venice, Italy, May 2003. Paper 83.
- D19. D.N. Wilke, J.F. Schutte, and A.A. Groenwold. On constrained non-convex optimization of structural systems using particle swarms. In *Proc. Fifth World Congress on Structural and Multidisciplinary Optimization*, Lido di Jesolo, Venice, Italy, May 2003. Paper 84.
- D20. A.A. Groenwold and J. Farkas. Selecting representative objective functions: a case study using swarm intelligence. In *Proc. Fifth World Congress on Structural and Multidisciplinary Optimization*, Lido di Jesolo, Venice, Italy, May 2003. Paper 85.

- D21. J.A. Snyman, H.P.J. Bolton, and A.A. Groenwold. A multi-start methodology for global optimization using novel local constrained optimizers. In C.A. Floudas and P.M. Pardalos, editors, *Proc. 4th International Conference on Frontiers in Global Optimization*, Santorini, Greece, June 2003.
- D22. J.F. Schutte, A.A. Groenwold, and R.T. Haftka. Optimization of arbitrary curved orthotropic shell structures using parallel swarm intelligence. In *Proc. 18th Annual Technical Conference of the American Society for Composites*, University of Florida, Gainesville, Florida, October 2003. Paper 200.
- D23. A. de Klerk and A.A. Groenwold. On the robustness of the Q4 membrane element. In A. Zingoni, editor, *Proc. Progress in Structural Engineering, Mechanics and Computation*, pages 961–966, Cape Town, South Africa, July 2004.
- D24. C.S. Long, A.A. Groenwold, and P.W. Loveday. Implications of element formulation on optimal topologies. In A. Zingoni, editor, *Proc. Progress in Structural Engineering, Mechanics and Computation*, pages 1015–1019, Cape Town, South Africa, July 2004.
- D25. P.W. Loveday, C.S. Long, and A.A. Groenwold. Ultrasonic motor resonator design using topology and shape optimization. In *Proc. of the SPIE 11th Annual International Symposium on Smart Structures and Materials*, San Diego, California, USA, March 2004.
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