Nicolas Moës

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Current position

Professor of Mechanical Engineering

Education

Engineering degree, Liège University, Belgium (1987-1992);
Master in Computational Mechanics, Ecole Normale Supérieure de Cachan, France (1993);
Ph.D. Ecole Normale Supérieure de Cachan, France (1996)
Habilitation, Université P. et M. Curie, France (2001)

Research interests

Computational Mechanics, Extended Finite element (X-FEM), level set, damage and fracture, contact mechanics.

Career

Professor at Ecole Centrale of Nantes since 2001 and promoted to the first class in 2007 and outstanding class in 2013.
Research Assistant Professor, Northwestern University, USA (1999 – 2001)
Research Associate, Northwestern University, USA (1998 – 1999)
Post-doctoral fellow, University of Texas at Austin, USA (1996-1998)

Honors and awards

Silver CNRS medal (2014)
Fellow member, International Association for Computational Mechanics (2008)
Elected at Institut Universitaire de France (2007)
Young investigator Award, International Association for Computational Mechanics (2006)
Jean Mandel Prize from the French association of mechanics (2003)
Young Researcher French award (*ACI Jeunes chercheurs*) (2002)

Professional activities

Associate Editor

European Journal of Mechanics / Solids
Meccanica

Editorial boards

Computer Methods in Applied Mechanics and Engineering
Advanced Modelling and Simulation in Engineering Sciences

University and (inter)national services

- Head of the Regional Doctoral school (350 Ph.D. students) (2008 – 2011)
- Chairman of the Ecole Centrale selection committee for hiring (2004 – 2007)
- Erasmus Mundus master in computational mechanics, in charge for Nantes (2007-2011)
- Member of the CNRS hiring National committee in engineering (section 9) (2008 – 2012)

Other relevant information

- co-Chairman of the workshop "challenges in computational mechanics" (Cachan, 2006), CFRAC (Nantes, 1997), CFRAC (Barcelona 2011), CFRAC (Prague 2013).
- Guest editor of 4 special issues (Computer Meth. Appl. Mech. Eng., Engineering Fracture Mechanics, Int. J. Num. Meth. Eng., European Journal of Computational Mechanics)
- Member of the scientific committees of over 20 international conferences
- Member of the scientific committee of the Lamsid/EDF R&D research institute
- Lecturer in 9 short courses (summer schools)

Funding

- ERC Advanced grant (2012-2017)
- Seven grants from industry in the period 2001-2010 : Snecma Moteurs, Peugeot, EDF R&D, CEA, Airbus, French Petroleum Institute
- Public grants over 2001-2010 : French Aeronautical and Space Foundation (FNRAE) and Regional Grant from Pays de Loire.

Publications

Over 44 refereed papers in international journals, 20 invited or keynote lectures at international conferences. One book and 5 chapters in book. Web Of Knowledge : H-index 24, more than 4900 citations, 14 papers with over 100 citations, 44 articles dans des revues internationales à comité de lecture.

Publication list

•Books

- Pommier, S., Gravouil, A., Moës, N., and A. Combescure, La simulation numérique de la propagation de fissures, Lavoisier, Hermès, 2009.
- Pommier, S., Gravouil, A., Combescure, A., and N. Moës, Extended finite element method for crack propagation, Wiley, 2011 (traduction anglaise de l'ouvrage ci-dessus).

•Chapters in book

1. Nguyen-Dang, H., Yan, A.-M., and N. Moës, Dual boundary element analysis of the multiple-cracked body, In Boundary Element Technology IX, C.A. Brebbia and A.S. Kassab, editors, pages 235-242, 1995.
2. Moës, N., Oden, J.T., and K. Vemaganti, A two-scale strategy and a posteriori error estimation for modeling heterogeneous structures, In. Advances in adaptive computational methods in mechanics, P. Ladevèze and J.T. Oden (Editors), Studies in Applied Mechanics #47, Elsevier Publication, pages 115-135, 1998.
3. Ladevèze, P. and N. Moës, A posteriori constitutive relation error estimators for nonlinear finite element analysis and adaptive control, In. Advances in adaptive computational methods in mechanics, P. Ladevèze and J.T. Oden (Editors), Studies in Applied Mechanics #47, Elsevier Publication, pages 231-256, 1998.
4. Moës, N., Modélisations de discontinuités arbitraires avec X-FEM, In. La méthode des éléments finis : extensions et alternatives, P. Breitkopf editor, Chapitre 4, Hermes, 2006.
5. Menouillard, T., Moës, N. and A. Combescure, An optimal explicit time stepping scheme for cracks modeled with X-FEM, pp 267-282, IUTAM Bookseries Symposium on discretization methods for evolving discontinuities, pages 267-282, Springer, 2006.
6. Moës, N., Chevaugeon, N. and F. Dufour, A regularized brittle damage model solved by a level set technique, pp 89 – 96, IUTAM Bookseries, volume 11, Springer, 2008.
7. Moës, N., Crack models based on the extended finite element method, in « Numerical modeling of concrete cracking », CISM Udine Book, Volume 532, Springer, 2011.

•Papers in ISI international journal

(1) Ladevèze, P. and N. Moës, A new a posteriori error estimation for nonlinear time-dependent finite element analysis, Comp. Meth. In Applied Mech. And Engrg., 157:45-68, 1998.
(2) Ladevèze, P. and N. Moës, Adaptive control for finite element analysis in plasticity. Computers and Structures, 73:45-60, 1999.
(3) Moës, N., Oden, J.T., and T.I. Zohdi, Investigation of the interactions between the numerical and the modeling errors in the homogenized Dirichlet projection method, Comp. Meth. In Applied Mech. And Engrg, 158:79-101, 1999.
(4) Oden, J.T., Vemaganti, K. and N. Moës, Hierarchical modeling of heterogeneous solids, Comp. Meth. In Applied Mech. And Engrg, 172:3-25, 1999.
(5) Moës, N., Dolbow, J. and T. Belytschko, A finite element method for crack growth without remeshing, Int. Journal for Num. Meth. In Engrg, 46:131-150, 1999.

(6) Sukumar, N., Moës, N., Belytschko, T. and B. Moran, Extended finite element method for three-dimensional crack modelling, Int. Journal for Num. Meth. In Engrg, 48:1549-1570, 2000.

(7) Daux, C., Moës, N., Dolbow, J., Sukumar N. and T. Belytschko, Arbitrary branched and intersecting cracks with the extended finite element method, Int. Journal for Num. Meth. In Engrg, 48:1741-1760, 2000.

(8) Dolbow, J., Moës, N. and T. Belytschko, Discontinuous enrichment in finite elements with a partition of unity method, Finite Element in analysis and design, 36:235:260, 2000.

(9) Stolarska, M., Chopp, D.L., Moës, N. and T. Belytschko, Modeling crack growth by level sets and the extended finite element method, Int. Journal for Num. Meth. In Engrg., 51:943-960, 2001.

(10) Sukumar, N., Chopp, D.L., Moës, N. and T. Belytschko, Modeling holes and inclusions by level sets in the extended finite element method, Comp. Meth. In Applied Mech. And Engrg., 190:6183-6200, 2001.

(11) Wagner, G., Moës, N., Liu, W.K. and T. Belytschko, The extended finite element method for Stokes flow past rigid cylinders, Int. Journal for Num. Meth. In Engrg., 51:293-313, 2001.

(12) Dolbow, J., Moës, N. and T. Belytschko, An extended finite element method for modeling crack growth with frictional contact, Comp. Meth. In Applied Mech. And Engrg., 190:6825-6846, 2001.

(13) Belytschko, T., Moës, N., Usui, S. and C. Parimi, Arbitrary discontinuities in finite elements, Int. Journal for Num. Meth. In Engrg., 50:993-1013, 2001.

(14) Moës, N., Gravouil, A. and T. Belytschko, Non-planar 3D crack growth by the extended finite element method and level sets, Part I : Mechanical model, Int. Journal for Num. Meth. In Engrg., 53:2548-2568, 2002.

(15) Gravouil, A., Moës, N. and T. Belytschko, Non-planar 3D crack growth by the extended finite element method and level sets, Part II : Level Set Update, Int. Journal for Num. Meth. In Engrg., 53:2569-2586 , 2002.

(16) Moës, N., and T. Belytschko, Extended finite element method for cohesive crack growth, Engineering fracture mechanics, 69:813-834, 2002.

(17) Belytschko, T., Parimi, C., Moës, N., Usui S. and N. Sukumar, Structured extended finite element methods of solids defined by implicit surfaces, Int. Journal for Num. Meth. In Engrg., 56:609-635, 2003.

(18) Budyn, E., Zi, G., Moës, N. and T. Belytschko, A model for multiple crack growth in brittle materials without remeshing, Int. Journal for Num. Meth. In Engrg., 61:1741-1770, 2004.

(19) Legrain, G., Moës, N. and E. Verron, Stress analysis around crack tips in finite strain problems using the eXtended finite element method, Int. Journal for Num. Meth. in Engrg, 63: 290-314, 2005.

(20) Béchet, E., Minnebo, H., Moës, N. and B. Burgardt, Improved implementation and robustness study of the X-FEM method for stress analysis around cracks. Int. Journal for Num. Meth. In Engrg., Int. Journal for Num. Meth. in Engrg, 64: 1033-1056, 2005.

(21) Moës, N., Béchet, E. and M. Tourbier, Imposing essential boundary conditions in the eXtended Finite Element Method, Int. Journal for Num. Meth. in Engrg., 67:1641-1669, 2006.

(22) Legrain, G., Moës, N. and A. Huerta, Stability of incompressible formulations enriched with X-FEM, Comp. Meth. In Applied Mech. And Engrg., 197:1835-1849, 2008.

(23) Rozycki, P., Moës, N., Béchet, E. and C. Dubois, X-FEM explicit dynamics for constant strain elements to alleviate mesh constraints on internal or external boundaries, Computer Methods in Applied Mechanics and Engineering, 197:349-363, 2008.

(24) Menouillard, T., Réthoré, J., Moës, N., Combescure, A. and H. Bung, Mass lumping strategies for X-FEM explicit dynamics: application to crack propagation, Int. Journal for Num. Meth. in Engrg., 74: 447-474, 2008.

(25) Nouy, A., Clément, A., Schoefs, F. and N. Moës, An extended stochastic finite element method for solving stochastic partial differential equations on random domains,
Computer Methods in Applied Mechanics and Engineering, 197:4663-4682, 2008.

(26) Legrain, G., Moës, N. and E. Verron, Robust and direct evaluation of J(2) in linear elastic fracture mechanics with the X-FEM, Int. Journal for Num. Meth. in Engrg., 76:1471-1488, 2008.

(27) Sukumar, N., Chopp, D., Béchet, E. and N. Moës, Three-dimensional non-planar crack growth by a coupled extended finite element and fast marching method, International Journal For Numerical Methods in Engineering, 76:727-748, 2008

(28) Nistor, I., Guiton, M.L.E., Massin, P., Moës, N. and S. Géniaut, An X-FEM approach for large sliding along discontinuities, Int. Journal for Num. Meth. in Engrg., 78: 1407-1435, 2009.

(29) Béchet, E. Moës, N. and B. Wohlmuth, A stable Lagrange multiplier space for stiff interface conditions within the extended finite element method, Int. Journal for Num. Meth. in Engrg., 78:931-954, 2009.

(30) Dubois, C., Le Corre, S., Zarroug, M., Rozycki, P. and N. Moës, Impact on highly compressible media in explicit dynamics using the X-FEM, Computational Mechanics, 46:329-348, 2010.

(31) Dréau, K., Chevaugeon, N. N. Moës, Studied X-FEM enrichment to handle material interfaces with higher order finite element, Computer Methods in Applied Mechanics and Engineering, 199:1922-1936, 2010.

(32) Moës, N., Stolz, C., Bernard, P.-E. and N. Chevaugeon, A level set based model for damage growth: The thick level set approach, Int. Journal for Num. Meth. in Engrg., 86:358-380, 2011.

(33) Legrain, G., Cartraud, P., Perreard, I., and N. Moës, An X-FEM and level set computational approach for image-based modelling: Application to homogenization, International Journal for Numerical Methods in Engineering, 86:915-934, 2011.

(34) Stolz, C. and N. Moës,A new model of damage : a moving thick layer approach, International Journal of Fracture, 174:49-60, 2012.

(35) Bonfils, N., Chevaugeon, N. and N. Moës, Treating volumetric inequality contarint in a continuum media with a coupled X-FEM/level-set strategy, Computer Methods in Applied Mechanics and Engineering, 205:16-28, 2012.

(36) Van der Meer F. P.; Moës N.; Sluys L. J., A level set model for delamination - Modeling crack growth without cohesive zone or stress singularity, Engineering Fracture Mechanics, 79:191-212, 2012.

(37) Bernard, P.-E., Moës, N. and N. Chevaugeon, Damage growth modeling using the Thick Level Set (TLS) approach: Efficient discretization for quasi-static loadings, Computer Methods in Applied Mechanics and Engineering, 233:11-27, 2012.

(38) Van der Meer, F.P., Sluys, L.J. and N. Moës, Toward efficient and robust computation of energy release rate and mode mix for delamination, Composites Part A : Applied Science and Manufacturing,43:1101–1112, 2012.

(39) Siavelis, M., Guiton, M.L.E., Massin, P., and N. Moës, Large sliding contact along branched discontinuities with X-FEM. Computational Mechanics, DOI 10.1007/s00466-012-0807-6, Novembre 2012.

(40) Chevaugeon, N., Moës, N. and H. Minnebo, Improved crack tip enrichment functions and integration for crack modeling using the extended finite element method, International Journal for multiscale computational engineering, Accepted, 2013.

•Papers in special issues

(A) Ladevèze, P., Moës, N. and B. Douchin, Constitutive relation error estimators for (visco)plastic finite element analysis with softening, Comp. Meth. In Applied Mech. And Engrg, 176:247-264, 1999.

(B) Moës, N., Oden, J.T., Vemaganti, K. and J.-F. Remacle, Simplified methods and a posteriori error estimation for the homogenization of representative volume elements (RVE), Comp. Meth. In Applied Mech. And Engrg, 176:265-268, 1999.

(C)   Dolbow, N. Moës and T. Belytschko, Modeling fracture in Mindlin-Reissner plates with the extended finite element method, Int. J. Solids and Structures, 37:7161:7183, 2000.
(D)   Moës, N., Cloirec, M. Cartraud, P. and J.-F. Remacle, A computational approach to handle complex microstructure geometries, Comp. Meth. In Applied Mech. And Engrg., 192:3163-3177, 2003.

•Papers in French Journals

(a) Moës, N. and T. Belytschko, X-FEM : De nouvelles frontières pour les éléments finis, Revue Européenne des éléments finis, 11:305-318, 2002.
(b) Cartraud, P., Cloirec M. and N. Moës, Application de la méthode X-FEM à la résolution de problèmes de micromécanique, Revue Européenne des éléments finis, 13:475-484, 2004.
(c) Guetari, Y., Le Corre, S. and N. Moës, Etude des possibilités de la méthode X-FEM pour la simulation numérique de la coupe, Mécanique et Industries 6, 315-319, 2005.
(d) Legrain, G., Moës, N. and A. Huerta, Stabilité de formulations incompressibles enrichies par X-FEM, Revue Européenne des éléments finis, Revue Européenne de Mécanique Numérique, 15:257-268, 2005.
(e) Géniaut, S., Massin, P. and N. Moës, A stable 3D contact formulation for cracks using X-FEM, Revue Européenne de Mécanique Numérique, Vol.16, n°2, Pages 259-276 , 2007.
(f) Nouy, A., Schoefs, A., and N. Moës, X-SFEM: A computational technique based on X-FEM to deal with random shapes, Revue Européenne de Mécanique Numérique, 16:277-293, 2007.
(g)Siavelis, M., Guiton, M.L.E., Massin, P., Mazet, S., and N. Moës. Robust implementation of contact under friction and large sliding with the extended finite element method. European Journal of Computational Mechanics, 19(1,2,3) :189–203, 2010.