Professor Dominik Schillinger

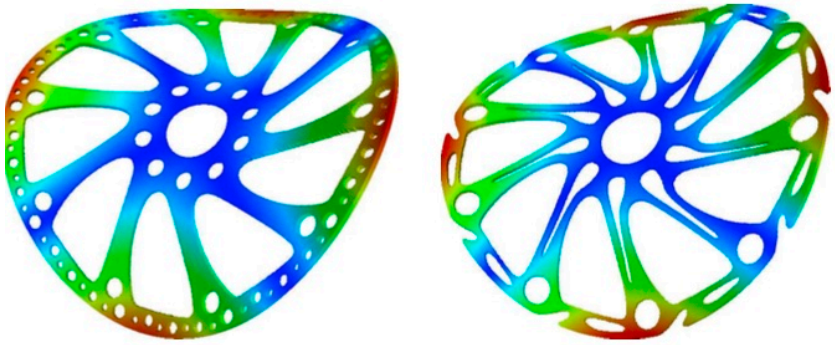

Fig. 87: *Mode shapes corresponding to the lowest eigenfrequency 3.7 Hz and 3.4 Hz of the two design variants.*

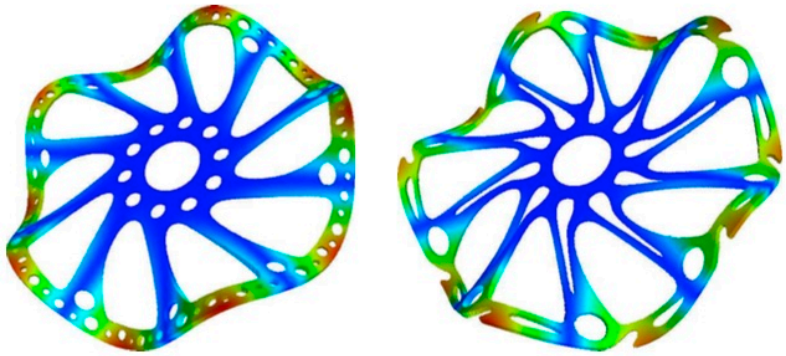

Fig. 88: *Mode shapes corresponding to eigenfrequency 19.4 Hz and 18.6 Hz.*

From: Schillinger D, Ruess M (2015) The finite cell method: a review in the context of higher-order structural analysis of CAD and image-based geometric models. Arch Comput Methods Eng 22(3):391–455

See:
https://sites.google.com/a/umn.edu/dominik/
http://www.cege.umn.edu/directory/faculty-directory/schillinger.html
https://www.researchgate.net/scientific-contributions/78213633_Dominik_Schillinger

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Autobiographical Summary:
My research interests are in computational mechanics, focusing on the modeling and finite element analysis of multiphysics and multiscale mechanical systems. In particular, I strive to develop novel geometry-through-analysis tools that enable the seamless transfer of complex geometric models from computer-aided design and biomedical imaging into simulation results. Specific applications driving my work include the computational design of aerodynamic structures (for example, turbine blades) and the integration of computer simulations in clinical practice, with the goal of enabling new patient-specific treatments (for example, for bone osteoporosis).

My work has been distinguished with a number of high-level research awards, in particular the IACM John Argyris Award, the GAMM Richard-von-Mises Prize, the ICE Zienkiewicz Medal, the NSF CAREER Award, and the EMI Leonardo da Vinci Award.

Education:
Ph.D., 2012, Computational Mechanics, Technische Universität München, Germany
M.S., 2008, Computational Mechanics, Universität Stuttgart, Germany
M.S., 2006, Structural Engineering, University of Connecticut
B.Eng., 2005, Civil Engineering, Universität Stuttgart, Germany

Selected Publications:
D. Schillinger, Stochastic FEM Based Stability Analysis of I-Sections With Random Imperfections., Diploma Thesis, (Universitat Stuttgart, 2008). http://www.ibb.uni-stuttgart.de/publikationen/fulltext/2008/schillinger-2008.pdf
D. Schillinger, V. Papadopoulos, M. Bischoff, M. Papadrakakis: Buckling Analysis of Imperfect I-Section Beam-Columns with Stochastic Shell Finite Elements, Computational Mechanics 46(3):495-510, 2010.
D. Schillinger and V. Papadopoulos, Accurate estimation of evolutionary power spectra for strongly narrow-band random fields, Computer Methods in Applied Mechanics and Engineering 199 (2010) 947–960.
D. Schillinger, E. Rank: An unfitted hp-adaptive finite element method based on hierarchical B-splines for interface problems of complex geometry. Computer Methods in Applied Mechanics and Engineering 200 (47-48):3358-3380, 2011.
D. Schillinger, L. Dede', M.A. Scott, J.A. Evans, M.J. Borden, E. Rank, T.J.R. Hughes: An Isogeometric Design-through-analysis Methodology based on Adaptive Hierarchical Refinement of NURBS, Immersed Boundary Methods, and T-spline CAD Surfaces. Computer Methods in Applied Mechanics and Engineering 249-250 :116-150, 2012.
D. Schillinger, M. Ruess, N. Zander, Y. Bazilevs, A. Düster, E. Rank, Small and large deformation analysis with the p- and B-spline versions of the Finite Cell Method, Computational Mechanics 50(4):445-478, 2012.
D. Schillinger, A. Düster, E. Rank: The hp-d adaptive Finite Cell Method for geometrically nonlinear problems of solid mechanics. International Journal for Numerical Methods in Engineering , 89 (9):1171-1202, 2012.
D. Schillinger, D. Stefanov, A. Stavrev: The method of separation for evolutionary spectral density estimation of multi-variate and multi-dimensional nonstationary stochastic processes, Probabilistic Engineering Mechanics 33:58-78, 2013.
D. Schillinger, J.A. Evans, A. Reali, M.A. Scott, T.J.R. Hughes: Isogeometric Collocation: Cost Comparison with Galerkin Methods and Extension to Adaptive Hierarchical NURBS Discretizations, Computer Methods in Applied Mechanics and Engineering 267:170-232, 2013.
D. Schillinger, Q. Cai, R.-P. Mundani, E. Rank: A review of the finite cell method for nonlinear structural analysis of complex CAD and image-based geometric models. In: M. Bader et al. (Eds.), Lecture Notes in Computational Science and Engineering, Springer Verlag, Berlin, 2013.
Schillinger D, Ruess M (2015) The finite cell method: a review in the context of higher-order structural analysis of CAD and image-based geometric models. Arch Comput Methods Eng 22(3):391–455
A. Stavrev, D. Stefanov, D. Schillinger, E. Rank: Comparison of Eigenmode based and random field based imperfection modeling for the stochastic buckling analysis of I-section beam-columns. International Journal of Structural Stability and Dynamics 13(2):1350021, 2013.
D. Schillinger, S.J. Hossain, T.J.R. Hughes: Reduced Bézier element quadrature rules for quadratic and cubic splines in isogeometric analysis. Computer Methods in Applied Mechanics and Engineering, 277:1-45, 2014.

M. Ruess, D. Schillinger, A.I. Özcan, E. Rank: Weak coupling for isogeometric analysis of non-matching and trimmed multi-patch geometries, Computer Methods in Applied Mechanics and Engineering 269:46-71, 2014.
D. Schillinger, J.A. Evans, F. Frischmann, R.R. Hiemstra, M.-C. Hsu, T.J.R. Hughes: A Collocated C^0 Finite Element Method: Reduced quadrature perspective, comparison with standard finite elements, and explicit structural dynamics. International Journal for Numerical Methods in Engineering, 102:576–631, 2015.
D. Schillinger, M. J. Borden and H. K. Stolarski, Isogeometric collocation for phase-field fracture models, Comput. Methods Appl. Mech. Eng. 284 (2015) 583–610.
D. Kamensky, M.-C. Hsu, D. Schillinger, J.A. Evans, A. Aggarwal, Y. Bazilevs, M.S. Sacks, T.J.R. Hughes: An immersogeometric variational framework for fluid-structure interaction: Isogeometric implementation and application to bioprosthetic heart valves. Computer Methods in Applied Mechanics and Engineering, 284:1005-1053, 2015.
M.-C. Hsu, C. Wang, A.J. Herrema, D. Schillinger, A. Ghoshal, Y. Bazilevs: An interactive geometry modeling and parametric design platform for isogeometric analysis. Computers & Mathematics with Applications, 70:1481–1500, 2015.
V. Varduhn, M.-C. Hsu, M. Ruess, D. Schillinger: The tetrahedral finite cell method: Higher-order immersogeometric analysis on adaptive non-boundary-fitted meshes. International Journal for Numerical Methods in Engineering, 107:1054–1079, 2016.
D. Schillinger, P.K. Ruthala, L.H. Nguyen: Lagrange extraction and projection for NURBS basis functions: a direct link between isogeometric and standard nodal finite element formulations. International Journal for Numerical Methods in Engineering, 108(6):515-534, 2016.
D. Schillinger, I. Harari, M.-C. Hsu, D. Kamensky, K.F.S. Stoter, Y. Yue, Y. Zhao: The non-symmetric Nitsche method for the parameter-free imposition of weak boundary and coupling conditions in immersed finite elements. Computer Methods in Applied Mechanics and Engineering, 309:625-652, 2016.
A. Stavrev, L.H. Nguyen, R. Shen, V. Varduhn, M. Behr, S. Elgeti, D. Schillinger: Geometrically accurate, efficient, and flexible quadrature techniques for the tetrahedral finite cell method. Computer Methods in Applied Mechanics and Engineering, 310:646-673, 2016.
L.H. Nguyen, D. Schillinger: A collocated isogeometric finite element method based on Gauss-Lobatto Lagrange extraction of splines. Computer Methods in Applied Mechanics and Engineering, 316:720–740, 2017.
R.R. Hiemstra, F. Calabrò, D. Schillinger, T.J.R. Hughes: Optimal and reduced quadrature rules for tensor product and hierarchically refined splines in isogeometric analysis. Computer Methods in Applied Mechanics and Engineering, 316:966-1004, 2017.
Y. Guo, M. Ruess, D. Schillinger:
A parameter-free variational coupling approach for trimmed isogeometric thin shells. Computational Mechanics, 59(4):693-715, 2017.
S. Faroughi, E. Shafei and D. Schillinger, "Isogeometric stress, vibration and stability analysis of in-plane laminated composite structures", International Journal of Structural Stability and Dynamics, Vol. 18, No. 5, 1850070, May 2018
D. Schillinger: Isogeometric Finite Element Analysis. In: H. Altenbach and A. Oechsner (Eds.), Encyclopedia of Continuum Mechanics, Springer Verlag, Berlin, 2018.
L.H. Nguyen, D. Schillinger: A multiscale predictor/corrector scheme for efficient elastoplastic voxel finite element analysis, with application to CT-based bone strength prediction. Computer Methods in Applied Mechanics and Engineering, 300:598-628, 2018.
D. Schillinger, T. Gangwar, A. Gilmanov, J.D. Heuschele, H.K. Stolarski: Embedded shell finite elements: solid-shell interaction, surface locking, and application to image-based bio-structures. Computer Methods in Applied Mechanics and Engineering, 335:298-326, 2018.

Y. Guo, J. Heller, T.J.R. Hughes, M. Ruess, D. Schillinger: Variationally consistent isogeometric analysis of trimmed thin shells at finite deformations, based on the STEP exchange format. Computer Methods in Applied Mechanics and Engineering, 336:39-79, 2018.
S.K.F. Stoter, S.R. Turteltaub, S.J. Hulshoff, D. Schillinger: Residual-based variational multiscale modeling in a discontinuous Galerkin framework. SIAM Multiscale Modeling & Simulation, 16(3):1333-1364, 2018.
L.H. Nguyen, D. Schillinger: A residual-driven local iterative corrector scheme for the multiscale finite element method. Journal of Computational Physics, 377:60-88, 2019.
S.K.F. Stoter, B. Cockburn, D. Schillinger: Mixed and discontinuous Galerkin methods through the lens of variational multiscale analysis. Submitted to Computer Methods in Applied Mechanics and Engineering, 2019.
Zhilin Han, Stein K.F. Stoter, Chien-Ting Wu, Changzheng Cheng, Angelos Mantzaflaris, Sofai G. Mogilevskaya and Dominik Schillinger, “Consistent discretization of higher-order interface models for thin layers and elastic material surfaces, enabled by isogeometric cut-cell methods”, Computer Methods in Applied Mechanics and Engineering, Vol. 350, pp 245-267, 15 June 2019