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Brief biography:
Christian Schenk, Dr., TIWAG Innsbruck Studium Maschinenwesen an der TU München, Promotion auf dem Gebiet der stochastischen Strukturmechanik am Institut für Mechanik an der LFU in Innsbruck. Seit 2003 TIWAG – Tiroler Wasserkraft AG im Bereich Engineering Services in der Anlagenplanung, Schwingungsüberwachung und -diagnose der Kraftmaschinensätze. 2005 mit dem IASSAR-Forschungspreis in der Stochastischen Dynamik ausgezeichnet.

Selected publications:
Schenk CA, Schuëller GI and Arbocz J. On the analysis of cylindrical shells with random imperfections. In: Proceedings of the ASS-IACM 2000. Fourth international colloquium on computation of shell & spatial structures, Chania-Crete; June 5–7, 2000.

Schenk CA, Schuëller GI, Arbocz J. Buckling analysis of cylindrical shells with random imperfections. In: Schuëller GI, Spanos PD, editors. Proceedings of the international conference on Monte Carlo simulation. Lisse, The Netherlands: Swets & Zeitlinger BV; 2001. p. 137–41.

Pradlwarter, H., G. Schuëller, & C. Schenk (2003). A computational procedure to estimate the stochastic dynamic response of large non-linear FE-models. Computer Methods in Applied Mechanics and Engineering 192(7-8), 777–801.

C. A. Schenk and G. I. Schuëller (Institute of Engineering Mechanics, Leopold-Franzens University, Technikerstr. 13, A-6020, Innsbruck, Austria), “Buckling analysis of cylindrical shells with random geometric imperfections”, International Journal of Non-Linear Mechanics, Vol. 38, No. 7, October 2003, pp. 1119-1132, doi:10.1016/S0020-7462(02)00057-4

ABSTRACT: In this paper the effect of random geometric imperfections on the limit loads of isotropic, thin-walled, cylindrical shells under deterministic axial compression is presented. Therefore, a concept for the numerical prediction of the large scatter in the limit load observed in experiments using direct Monte Carlo simulation technique in context with the Finite Element method is introduced. Geometric imperfections are modeled as a two dimensional, Gaussian stochastic process with prescribed second moment characteristics based on a data bank of measured imperfections. (The initial imperfection data bank at the Delft University of Technology, Part 1. Technical Report LR-290, Department of Aerospace Engineering, Delft University of Technology). In order to generate realizations of geometric imperfections, the estimated covariance kernel is decomposed into an orthogonal series in terms of eigenfunctions with corresponding uncorrelated Gaussian random variables, known as the Karhunen–Loéve expansion. For the determination of the limit load a geometrically non-linear static analysis is carried out using the general purpose code STAGS (STructural Analysis of General Shells, user manual, LMSC P032594, version 3.0, Lockheed Martin Missiles and Space Co., Inc., Palo Alto, CA, USA). As a result of the direct Monte Carlo simulation, second moment characteristics of the limit load are presented. The numerically predicted statistics of the limit load coincide reasonably well with the actual observations, particularly in view of the limited data available, which is reflected in the statistical estimators.

Schenk CA, Schuëller GI. Uncertainty assessment of large finite element systems. Berlin: Springer Verlag; 2005.

G. I. Schuëller, A. Calvi, H. J. Pradlwarter, S. Fransen, M. F. Pellissetti, C. Schenk, M. Klein, and A. Kreis. Uncertainty and reliability analysis of large aerospace structures. In Proceedings of the European Conference on Spacecraft Structures, Materials and Mechanical Testing 2005, SP-581, Noordwijk, The Netherlands, September 2005.

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“Non-Linear Static Analysis”, Chapter 5 in Uncertainty Assessment of Large Finite Element Systems
Lecture Notes in Applied and Computational Mechanics, 2005, Vol. 24, pp. 23-27, doi: 10.1007/11673941_5
ABSTRACT: The state of the art in the capability to predict the stability behavior of shell structures refers to areas such as asymptotic analysis [69] and general nonlinear analysis (see e.g. [16, 30]). In both approaches, the solution of equilibrium equations under variation of a number of parameters such as load level, imperfection magnitude etc., is necessary. Of paramount interest is the determination of the so-called critical points. Two fundamental problems have to be distinguished in the field of structural stability: the buckling problem and the collapse or snap-through problem, respectively. The corresponding critical points are denoted as bifurcation points and limit points. By definition a bifurcation point describes the equilibrium state of a structure where distinct non-interacting solutions are possible. The limit point on the other hand characterizes the local maximum of the load-deflection curve. Contrary to perfect structures, imperfect structures do not show a clear separation of response modes. Instead, the response is a combination of all excited modes. Depending on the magnitude of the imperfection, it is possible that bifurcation points may vanish.

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“Buckling analysis of cylindrical shells with cutouts including random boundary and geometric imperfections”, Computer Methods in Applied Mechanics and Engineering, Vol. 196, Nos. 35-36, July 2007, pp. 3424-3434, doi:10.1016/j.cma.2007.03.014

ABSTRACT: In this paper, the effect of random geometric imperfections on the critical load of isotropic, thin-walled, cylindrical shells under axial compression with rectangular cutouts is presented. Second moment characteristics of geometric imperfections are estimated by data of available measurements, a simulation procedure based on the Karhunen–Loève expansion is applied for generating realizations of geometric imperfections. Nonlinear static finite-element analyses are carried out for the calculation of the response statistics of the critical load of the cylindrical shells. Cumulative distribution functions of the critical load as obtained by direct Monte Carlo simulation are presented. Furthermore, the individual and combined effects of random boundary and geometric imperfections on the limit loads of isotropic, thin-walled, cylindrical shells under axial compression are also treated. Again, second moment characteristics of these imperfections are estimated by data of available measurements of imperfections, a simulation procedure also based on the Karhunen–Loève expansion is applied for generating realizations of both boundary and geometric imperfections. A nonlinear static finite-element analysis using the general purpose code STAGS [C.C. Rankin, F.A. Brogan, W.A. Loden, H.D. Cabiness. STAGS (STructural Analysis of General Shells) User Manual, LMSC P032594, Version 3.0. Lockheed Martin Missiles and Space Co., Inc., Palo Alto, CA, USA, 1998] is carried out for the calculation of the buckling response of the cylindrical shells. Finally, the cumulative distribution functions of the limit load using direct Monte Carlo simulation are shown.