ASIGURAREA CALITĂȚII – QUALITY ASSURANCE

CUPRINS – CONTENTS

Asigurarea Calităţii – Quality Assurance, ISSN 1224–5410
Vol. XV, Issue 59, July-September 2009
Pages 2 - 6

Quality Management: The New Challenges

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Abstract
This paper puts forward the argument that there are two kinds of quality management – „old“ or classical quality management and „new“ quality management. The aim of classical quality management was to analyse errors and eliminate their causes and associated variation by improved product and process design. In recent times a number of major changes have taken place resulting in increased volatility in key areas of a business, which „old“ quality management has difficulty in addressing. These changes are being driven by competitive pressure, the need for improved results from the financial market and increasing shrinkage of buying points. This has lead to pressure on prices, performance and innovation and the need for increased flexibility, agility and economics of scale, with a concentration on core competencies within the business. This situation demands a „new“ form of quality management. The paper examines the main problems caused by these changes in terms of improved longer term relationships, softer influences on customer satisfaction, growing importance of software, and closer co-operation between internal functions and externally between supply chain partners.

Keywords: Management, classical quality management, new quality management, relationships, customer satisfaction.

References:

[1] P.B. Crosby, Quality is free, New American Library, New York, 1979.
[2] W.E. Deming, Out of the crises, MIT Centre for Advanced Engineering Study, Cambridge, MA, 1986.
[3] A.V. Fiegenbaum, Total quality control, McGraw-Hill, New York, 1961.
[4] M. Grabowski, and K.H. Roberts, Risk Mitigation in Virtual Organizations, Organization Science, 10 (6), 1999, pp. 704-721.
[5] J.M. Juran, and A.B. Godfrey (editors), Juran’s Quality Handbook, fifth edition, McGraw-Hill Companies, New York, 1998.
[6] M. Nakamura, S. Sakakibara, and R. Schroeder, Adoption of just-in-time manufacturing methods at US - and Japanese - owned plants: some empirical evidence, IEEE Transactions on Engineering Management, 45 (3), 1998, pp.230-240.
[7] B.J. Pine, and J.H. Gilmore, The Experience Economy, Harvard Business School Press, Boston, 1999.
[8] F. Price, Right First Time: Using Quality Control for Profit, Gower Publishing Company, New York, 1984.
[9] K.H. Roberts, V. Desai, and P. Madsen, Organization Reliability, Flexibility, and Security, in: E. Kossek and S. Lambert (Eds.), Work and Life Integration, Mahwah, NJ, Erlbaum, 2004, pp. 85-102.
[10] E. Snape, A. Wilkinson, M. Marchington, and T. Redman, Managing human resources for TQM: possibilities and pitfalls, Employee Relations, 17 (3), 1995, pp. 42-51.

Asigurarea Calităţii – Quality Assurance, ISSN 1224–5410
Vol. XV, Issue 59, July-September 2009
Pages 7 - 14

State Estimation of Hybrid Dynamic Systems by Monte Carlo - Based (Particle) Filtering

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Abstract
The dynamics of many engineered systems is characterized by transitions among discrete modes of operation, each one giving rise to a specific evolution in time. The estimation of the state of these hybrid dynamic systems requires keeping track of the transitions among the multiple modes of system dynamics. In this paper, a Monte Carlo-based estimation method is illustrated with an application to a case study of literature which consists of a tank filled with liquid, whose level is autonomously maintained between two thresholds. The system behaviour is controlled by discrete mode actuators, whose states are estimated by a Monte Carlo-based particle filter on the basis of noisy level and temperature measurements.

Keywords: Hybrid dynamic systems, system behaviour, state estimation, Monte Carlo method, particle filter.

References:

[1] A. S. Willsky, A Survey of Design Methods for Failure Detection in Dynamic Systems, Automatica, Vol. 12, 1976, pp. 601-611.
[2] M. Marseguerra, E. Zio, P. Baraldi, I. C. Popescu, P. Ulmeanu, A Fuzzy Logic – based Model for the Classification of Faults in the Pump Seals of the Primary Heat Transport System of a Candu 6 Reactor", Nuclear Science and Engineering, Vol. 153, No. 2, pp. 157-171, 2006.
[3] J. Reifman, Survey of Artificial Intelligence Methods for Detection and Identification of Component Faults in Nuclear Power Plants, Nucl. Technol., 119, 76 ~1997.
[4] A. Doucet, On Sequential Simulation-Based Methods for Bayesian Filtering, Technical Report, University of Cambridge, Dept. of Engineering, CUED-F-ENG-TR310, 1998.
[5] A. Doucet, J.F.G. de Freitas, and N.J. Gordon, An Introduction to Sequential Monte Carlo Methods, in Sequential Monte Carlo in Practice, A. Doucet, J.F.G. de Freitas and N.J. Gordon, Eds., New York: Springer-Verlag, 2001.
[6] G. Kitagawa, Non-Gaussian State-Space Modeling of Nonstationary Time Series, Journal of the American Statistical Association, Vol. 82, 1987, pp. 1032-1063.
[7] B.D. Anderson and J.B. Moore, Optimal Filtering, Englewood Cliffs, NJ: Prentice Hall, 1979.
[8] P.M. Djuric, J.H. Kotecha, J. Zhang, Y. Huang, T. Ghirmai, M. F. Bugallo, J. Miguez, Particle Filtering, IEEE Signal Processing Magazine, 2003, pp. 19-37.
[9] A. Doucet, S. Godsill and C. Andreu, On Sequential Monte Carlo Sampling Methods for Bayesian Filtering, Statistics and Computing, Vol 10, 2000, pp. 197-208.
[10] Wang, P., Chen X.M. and Aldemir T., 2002, DSD: a Generic Software Package for Model-Based Fault Diagnosis in Dynamic Systems, Reliability Engineering and System Safety, 75, pp. 31-39.

Asigurarea Calităţii – Quality Assurance, ISSN 1224–5410
Vol. XV, Issue 59, July-September 2009
Pages 7 - 14

[11] T. Aldemir, N. Siu, A. Mosleh, P.C. Cacciabue, and B.G.Goktepe, Eds.: Reliability and Safety Assessment of Dynamic Process Systems, NATO-ASI Series F, Vol. 120, Berlin: Springer-Verlag, 1994.
[12] M. Marseguerra, and E. Zio, Monte Carlo approach to PSA for dynamic process systems, Reliability Engineering and System Safety, Vol. 52, 1996, pp. 227-241.
[13] P.E. Labeau, and E. Zio, The Cell-to-Boundary Method in the Frame of Memorization-Based Monte Carlo Algorithms. A New Computational Improvement in Dynamic Reliability, Mathematics and Computers in Simulation, Vol. 47, 1998, 2-5, pp. 329-347.
[14] M.S. Arulampalam, S. Maskell, N. Gordon and T. Clapp, A Tutorial on Particle Filters for Online Nonlinear/Non-Gaussian Bayesian Tracking, IEEE Trans. On Signal Processing, Vol. 50, No. 2, 2002, pp. 174-188.
[15] U. Pulkkinen, A Stochastic Model for Wear Prediction through Condition Monitoring, K. Holmberg and A. Folkeson editors, Operational Reliability and Systematic Maintenance, London/New York: Elsevier; 1991, pp. 223-243.
[16] S.-H. Seong, H.-Y. Park, D.-H. Kim, Y.-S. Suh, S. Hur, I.-S. Koo, U.-C. Lee, J.-W. Jang and Y.-C. Shin, Development of Fast Running Simulation Methodology Using Neural Networks for Load Follow Operation, Nuclear Science and Engineering, Vol. 141, 2002, pp. 66-77.
[17] M.H. Kalos and P.A. Whitlock, Monte Carlo methods. Volume I: basics, Wiley, 1986.
[18] H. Tanizaki, Nonlinear and nonnormal filters using Monte Carlo methods, Computational Statistics & Data Analysis, Vol. 25, 1997, pp. 417-439.
[19] H. Tanizaki and R.S. Mariano, Nonlinear and Non-Gaussian State-Space Modeling with Monte Carlo Simulations, Journal of Econometrics Vol. 83, 1998, pp. 263-290.
[20] M. Marseguerra, E. Zio and L. Podofillini, Condition-Based Maintenance Optimization by Means of Genetic Algorithms and Monte Carlo Simulation, Reliability Engineering and System Safety, Vol. 77, 2002, pp. 151-165.

Asigurarea Calităţii – Quality Assurance, ISSN 1224–5410
Vol. XV, Issue 59, July-September 2009
Pages 15 - 19

Dynamic Fault Tree Analysis for Multi - Level Cold Standby

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Abstract
It is shown that a typical modern fault tree analysis (FTA), resulting in the Boolean domain in a short pseudopolynomial, i.e., a polynomial in the literals X1, X1, X2, X2, ..., of the FT input variables, can yield grave errors in case of cold standby, even though the single terms are apparently evaluated correctly via convolution. Expanding the FT terms to minterms gives correct results, yet with considerable computational effort. Hence, here the FT is transformed to a special syntax tree based mainly on dual functions and on convolution which can be readily evaluated to give (strict sense) system reliability.

Keywords: Fault tree, Minterm, Syntax tree, Cold Standby, Convolution, Dual function, Priority AND.

References:

[1] J. Vaurio, Treatment of general dependencies in system fault tree and risk analysis, IEEE Trans. Reliability 51 (2002), 278-288.
[2] W. Schneeweiss, Reliability Modeling, LiLoLe-Verlag 2001.
[3] W. Schneeweiss, The Fault Tree Method, LiLoLe-Verlag 1999.
[4] Y. Dutuit, A. Rauzy, Exact and truncated computations of prime implicants of coherent and non-coherent fault trees with ARALIA, Reliability Engg. and System Safety 58 (1997), 127-144.
[5] M. Bozzano, A. Villafiorita, Integrating fault tree analysis with event ordering information, Proc. ESREL 2003, 247-254.
[6] J. Bechta Dugan, S. Bavuso, M. Boyd, Dynamic fault-tree models for fault-tolerant computer systems, IEEE Trans. Reliability 41 (1992), 363-377.
[7] J. Fussel, E. Aber, R. Rahl, On the quantitative analysis of Priority AND failure logic, IEEE Trans. Reliability 25 (1976), 324-326.

Asigurarea Calităţii – Quality Assurance, ISSN 1224–5410
Vol. XV, Issue 59, July-September 2009
Pages 20 - 23

Recent Advances in System Reliability Theory Using Signatures

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Abstract
The purpose of the paper is to show the recent advances in the representations of system reliability functions based on mixtures and signatures. The first representation obtained by Samaniego in 1985 holds only for coherent systems with independent and identically continuously distributed components. Under some symmetry assumptions we show that these representations can be extended to systems with dependent components. They can also be extended to systems with different number of components and to mixed systems, that is, to mixtures of coherent systems. To obtain these new representations, we need to do some changes in the definitions of signature vectors.

Keywords: Coherent systems, signatures, reliability, mixtures, stochastic orders.

References:

[1] P.J. Boland, and F.J. Samaniego, The signature of a coherent system and its applications in reliability, in: Mathematical Reliability: An Expository Perspective (Eds., R. Soyer, T. Mazzuchi and N.D. Singpurwalla), Kluwer Publishers, Boston, 2004, pp. 1-29.
[2] X. Li, and Z. Zhang, Some stochastic comparisons of conditional coherent systems, Appl. Stoch. Models Bus. Industry, 24, 2008, pp. 541-549.
[3] J. Navarro, N. Balakrishnan, and F.J. Samaniego, Mixture representations of residual lifetimes of used systems, J. Appl. Probab. 45 (4), 2008, pp. 1097-1112.
[4] J. Navarro, A. Guillamon and M.C. Ruiz, Generalized mixtures in reliability modelling: Applications to the construction of bathtub shaped hazard models and the study of systems, Appl Stoch Models Bus Industry 25(3), 2009, pp. 323-337.
[5] J. Navarro, and P.J. Hernandez, Mean residual life functions of finite mixtures and systems, Metrika 67, 2008, pp. 277-298.
[6] J. Navarro, and R. Rubio, Computation of signatures of coherent systems with five components, To appear in Comm Statist Simulation and Computation, 2009.
[7] J. Navarro, J. M. Ruiz, and C.J. Sandoval, Properties of coherent systems with dependent components, Comm. Statist. Theory Methods 36(1), 2007, pp. 175-191.
[8] J. Navarro, and T. Rychlik, Reliability and expectation bounds for coherent systems with exchangeable components, J. Multivariate Anal. 98, 2007, pp. 102-113.
[9] J. Navarro, F.J. Samaniego, N. Balakrishnan, and D. Bhattacharya, On the application and extension of system signatures to problems in engineering reliability, Naval Res. Logist. 55, pp. 313-327.
[10] F.J. Samaniego, On closure of the IFR class under formation of coherent systems, IEEE Trans. Reliab, R-34, 1985, pp. 69-72.

Asigurarea Calităţii – Quality Assurance, ISSN 1224–5410
Vol. XV, Issue 59, July-September 2009
Pages 20 - 23

[11] F.J. Samaniego, System Signatures and their Applications in Engineering Reliability, International Series in Operations Research & Management Science, Vol. 110, Springer, New-York, 2007.
[12] F.J. Samaniego, N. Balakrishnan, and J. Navarro, Dynamic Signatures and their Use in Comparing the Reliability of New and Used Systems, To appear in Naval Research Logistics.
[13] M. Shaked and J.G. Shanthikumar, Stochastic Orders, Springer, New York, 2007.

Asigurarea Calităţii – Quality Assurance, ISSN 1224–5410
Vol. XV, Issue 59, July-September 2009
Pages 24 - 32

A Method for Sensitive Analysis of Workpieces Rupturre During Extrusion Processes

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Abstract
This paper describes a method for sensitive analysis of workpieces rupture during extrusion processes. The proposed approach includes finite element simulation and neural networks analysis. The simulation can predict forming defects such as cracks initiation and propagation within the workpiece. Because Finite element simulation is a time consuming repeated analyses, the neural networks are employed in this investigation as numerical devices for substituting the finite element code needed for the workpiece defect prediction. The results obtained by simulation in the case of extrusion show that the risk of appearance of defects is localized to external surfaces, which is in conformity with experimental observations. A back propagation training neural network model was trained by using the numerical results. The network has been employed as numerical devices for substituting the finite element code needed for the maximum damage prediction within the extruded part.

Keywords: Reliability, Failure, Extrusion processes, Sensitive analysis, Finite element, Neural network.

References:

[1] M. T. Todino, „Estimating the probabilities of triggering brittle fracture associated with the defects in the materials", Materials Science and Engineering A, Volume 302, Issue 2, 2001, p: 235-245.
[2] V. Papadopoulos Papadrakakis, and N.D. Lagaros, „Structural reliability analysis of elastic-plastic structures using neural networks and Monte Carlo simulation" Comput. Methods Appl. Mech. Engrg. 136, 1996, p: 145-163.
[3] K. Lange, „Handbook of metal forming", McGraw-Hill Book Company, 1985.
[4] P. Hartley, I. Pillinger, and C. Sturgess, „Numerical modeling of material deformation processes research, development and applications", Springer-Verglag, 1992.
[5] Proceeding of Advanced Methods in Material Processing Defects Int. Conf., (Paris), July 1997.
[6] R. Hambli, and A. Potiron, „Finite element modeling of sheet-metal blanking operations with experimental verification", Jour. of Mat. Proc. Tech., 2000, p: 257-265.
[7] R. Hambli, „Numerical fracture prediction during sheet-metal blanking processes", Engineering Fracture Mechanics, Volume 68, Issue 3, 2000, p: 365-378.
[8] S.E. Clift, P. Hartley, C.E.N. Sturgess and G.W. Rowe, „Fracture prediction in plastic deformation process", Int. J. Mech. Sci. Vol.32 n°1, 1990, p: 1-17.
[9] J.L. Chaboche, „Continuous damage mechanics – A tool to describe phenomena before crack initiation", Nucl. Engrg. Des. 64, 1981, p: 233-247.

Asigurarea Calităţii – Quality Assurance, ISSN 1224–5410
Vol. XV, Issue 59, July-September 2009
Pages 24 - 32

[10] J. Lemaitre, „A continuous damage mechanics model for ductile fracture“, Journal of Engineering Materials and Technology, Vol. 107, 1985, p: 83-89.
[11] A.L. Gurson, „Continium theory of ductile rupture by void nucleation and growth“, J. Eng. Materials and Technology, Trans. of the ASME, Vol. 99, 1977, p: 2-15.
[12] V. Tvergaard, „Material failure by void growth to coalescence“, Advances in Applied Mechanics 27, 1990, p. 83-151.
[13] ABAQUS – HKS theory manual – Version 5.8
[14] M.A. Criesfield, „Non linear finite element analysis of solids and structures“, Vol. 1, Wiley, 1991.
[15] J.M.M. Marques, „Stress computation in elastoplasticity“, Eng. Comput., Vol. 1, 1984.
[16] M.Y. Rafiq, G. Bugmann and D.J. Easterbrook, „Neural network design for engineering applications“, Computers & Structures, Vol. 79, Issue 17, 2001, p: 1541-1552.
[17] Z. Waszczyszyn, and L. Ziemiaski, „Neural networks in mechanics of structures and materials - new results and prospects of applications“, Comp. & Struc., Vol. 79, Issues 22-25, 2001, p: 2261-2276.
[18] J.E. Hurtado, and D.A. Alvarez, „Neural-network-based reliability analysis: a comparative study“, Comp. Methods in Applied Mechanics and Engineering, Vol. 191, Issues 1-2, 9, 2001, p: 113-132.
[19] J.E. Hurtado, „Analysis of one-dimensional stochastic finite elements using neural networks“, Probabilistic Engineering Mechanics, Volume 17, Issue 1, 2002, p: 35-44.
[20] E.M.A. El-Kassas, R.I. Mackie, and A.I. El-Sheikh, „Using neural networks in cold-formed steel design“, Computers & Structures, Vol. 79, Issue 18, 2001, p: 1687-1696.
[21] G. Bugmann, „Normalized radial basis function networks. Neurocomputing“, [special issue on Radial Basis Function Networks] 20, 1998, p: 97-110.
[22] W.M. Jenkins, „An introduction to neural computing for the structural engineer“, The Struct Engng 75 3, 1997, p: 38-41.