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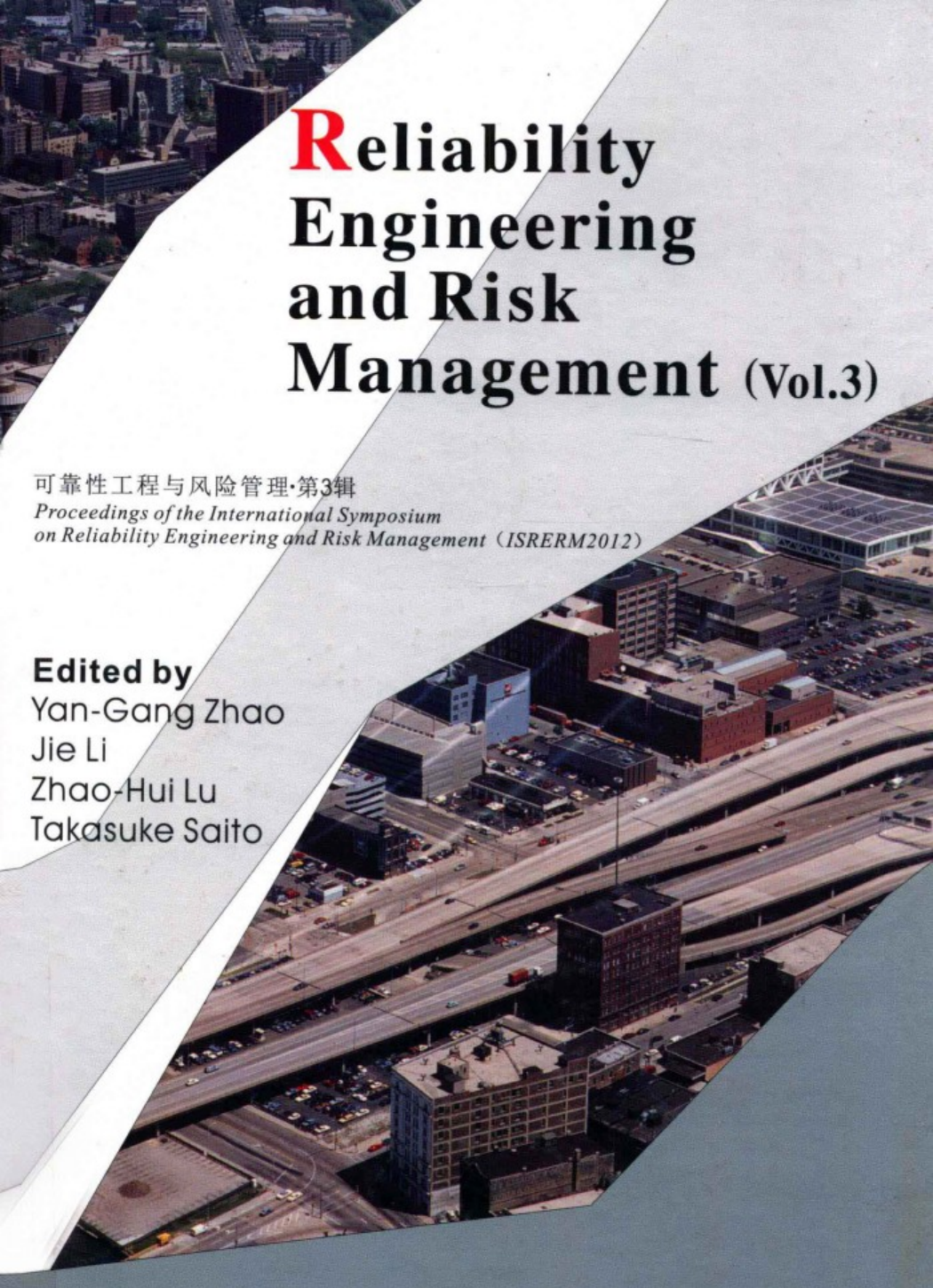
可靠性工程与风险管理·第3辑

Proceedings of the International Symposium on Reliability Engineering and Risk Management (ISRERM2012)

Edited by
Yan-Gang Zhao
Jie Li
Zhao-Hui Lu
Takasuke Saito



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Preface

Reliability engineering and risk management are a crossed frontier research of probabilistic mechanics and engineering disciplines, which has gained increasing attention in the past ten years, and of growing significance in civil, architectural, mechanical, aerospace and aeronautics, offshore and marine engineering, as well as in many other disciplines of engineering. This research field provides effective methodologies for reducing the risk of engineering and promoting the sustainability of development of human society.

With this background, the International Workshop on Reliability Engineering and Risk Management (IWRERM'08) and the International Symposium on Reliability Engineering and Risk Management (ISRERM'2010) were successfully held at Tongji University on Aug. 21-23, 2008 and Sept. 23-26, 2010, respectively. The participants of the Symposium believe that the ISRERM'2010 was a very fruitful and successful event and thus strongly suggest that the Symposium should be held periodically.

The International Symposium on Reliability Engineering and Risk Management (ISRERM'2012) was organized and held on August 5-8, 2012 at Kanagawa University in Yokohama, Japan. This symposium is co-organized by Kanagawa University, Tongji University, Central South University and the International Association of Structural Safety and Reliability (IASSAR), and is jointly sponsored by the large number of academic societies. It aims to bring engineers and scientists all over the world together to present and discuss innovative methodologies and practical applications of these technologies in the field of reliability engineering and risk management.

The proceedings contains 107 papers from 24 countries and regions (Algeria, Australia, Canada, China, Colombia, Croatia, Denmark, France, Germany, Indonesia, Iran, Israel, Italy, Japan, Korea, New Zealand, Peru, Singapore, Spain, Taiwan, Thailand, The Netherlands, United Kingdom, and USA). We are grateful to the contributions from the participants and authors who make this symposium successful.

Editors: Yan-Gang Zhao, Jie Li, Zhao-Hui Lu & Takasuke Saito

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Kanagawa University, Tongji University, Central South University, and International Association for Structural Safety and Reliability (IASSAR)

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A. H-S. Ang: Minimizing the effects of uncertainty in reliability-based design

Keynote Lectures

R. E. Melchers: Structural reliability estimation for steel structures affected by pitting corrosion

T. Takada: Robustness and resilience as extensions of risk concept after Fukushima event

J. Li: Seismic reliability based optimization and design of urban water supply networks

S. M. Gupta: Reverse Logistics: A Review

Invited Plenary Lectures

D. M. Frangopol: Life-cycle management of fatigue critical structures under uncertainty

H. Furuta: Structural damage assessment based on chaos theory

W. L. Jin: Reliability of offshore structures in deep water

Y. Mori: Seismic risk information provided on web sites for owners of non-conforming wooden houses

S. T. Quek: Structural reliability analysis within a changing environment

S. H. Kim: Reliability analysis on the long-term degradation of tendon force in nuclear containment

J. B. Chen: PDEM-based global reliability of engineering structures

Contents

Minimizing the effects of uncertainty in reliability-based design

A. H-S. Ang

University of California, Irvine, CA, USA

ABSTRACT: Reducing uncertainties in engineering is not always practically feasible. However, minimizing the effects of uncertainties may be more realistic to achieve. Proposed is a procedure for this latter purpose. By separating uncertainties into two types—the variability in observed data and information known as the *aleatory* type, and those associated with our inability to predict reality known as the *epistemic* type. The variability can be expressed in terms of a probability (e. g. probability of failure or safety index); whereas in light of the epistemic uncertainty the correct probability becomes a random variable. On this basis, the effect of the underlying uncertainties, especially of the epistemic type, can be minimized in formulating reliability-based design; the same procedure is equally applicable for developing risk-informed decisions.