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Cláudia Ferreira
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Maintainability of Building Envelope Elements

Optimizing Predictive Condition-Based
Maintenance Decisions

 Springer

Springer Series in Reliability Engineering

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ISSN 1614-7839

ISSN 2196-999X (electronic)

Springer Series in Reliability Engineering

ISBN 978-3-031-14766-1

ISBN 978-3-031-14767-8 (eBook)

<https://doi.org/10.1007/978-3-031-14767-8>

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Foreword

My acquaintance with the research of Dr. Ana Silva lasts for more than a decade during which Dr. Silva developed her Masters and Ph.D. research to a series of comprehensive and fruitful research that developed the concept of condition based as a foundation for future developments of integrating ML, AI, ANN in future applications of automated performance, and maintenance management of smart buildings. Dr. Silva has proved creative research personality, highly devoted and committed to her research theme, and I regard as an outstanding young researcher and academic.

The book is a comprehensive textbook that introduces the background and history of maintenance in industry and in built facilities; it follows with the concepts of durability and sustainability in buildings with emphasis on exterior envelope elements. Alternative maintenance strategies are then reviewed with comprehensive assessment of their impact on the life cycle of building components and life cycle costs. Petri nets and Markov chains are introduced, implemented and reviewed with optimization of the probability distribution functions. This is an important phase that I conceived as a basis for future control of smart building maintenance and performance management.

The concept of maintainability of exterior building components is conceptualized and well introduced; a maintainability model is comprehensively conceptualized and can be further developed into smart building management, integrating life cycle costs optimization and sustainability.

A multi-objective optimization modelling is developed and implemented for optimization of the maintenance and performance of facilities; this concept develops the way for integrated smart building control integrating further factors such as resilience and safety.

The book is an outstanding retrospective piece of research of Dr. Silva; it is an excellent graduate classes textbook for in facilities management and for research in smart buildings facilities management.

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Acknowledgements The authors gratefully acknowledge the support of the Fundação para a Ciência e a Tecnologia (FCT) to the project PTDC/ECI-CON/29286/2017 “Buildings’ Envelope SLP-based Maintenance: Reducing the risks and costs for owners”. The authors would also like to acknowledge the support of FCT to the research centre Civil Engineering Research and Innovation for Sustainability (CERIS), based on Instituto Superior Técnico, University of Lisbon.

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






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Nomenclature

Acronyms

ACT	Architectural Concrete Façades
AWF	Aluminium Window Frames
BIM	Building Information Modelling
CCPR	Ceramic Claddings in Pitched Roofs
CDF	Cumulative Distribution Function
CTS	Ceramic Tiling Systems
EI	Efficiency Index
ETICS	External Thermal Insulation Composite Systems
GA	Genetic Algorithm
ICDF	Inverse Cumulative Distribution Function
LCC	Life Cycle Costs
MA	Maintenance Actions
MC	Markov Chains
MCDA	Multi-Criteria Decision Analysis
MCS	Monte Carlo Simulation
MOOP	Multi-Objective Optimization Problem
MS	Maintenance Strategy
MS1	Maintenance Strategy 1
MS2	Maintenance Strategy 2
MS3	Maintenance Strategy 3
MS4	Maintenance Strategy 4
NSC	Natural Stone Claddings
PN	Petri Nets
PS	Painted Surfaces
RF	Rendered Façades
SOOP	Single-Objective Optimization Problem
TPN	Timed Petri Nets
WSM	Weighted Sum Method
WWF	Wooden Window Frames

Petri Net Symbology

	Place
	Directed arc
	Bidirectional arc
	Inhibitor arc
	Immediate transition
	Time delay transition
	Reset transition
	Token

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