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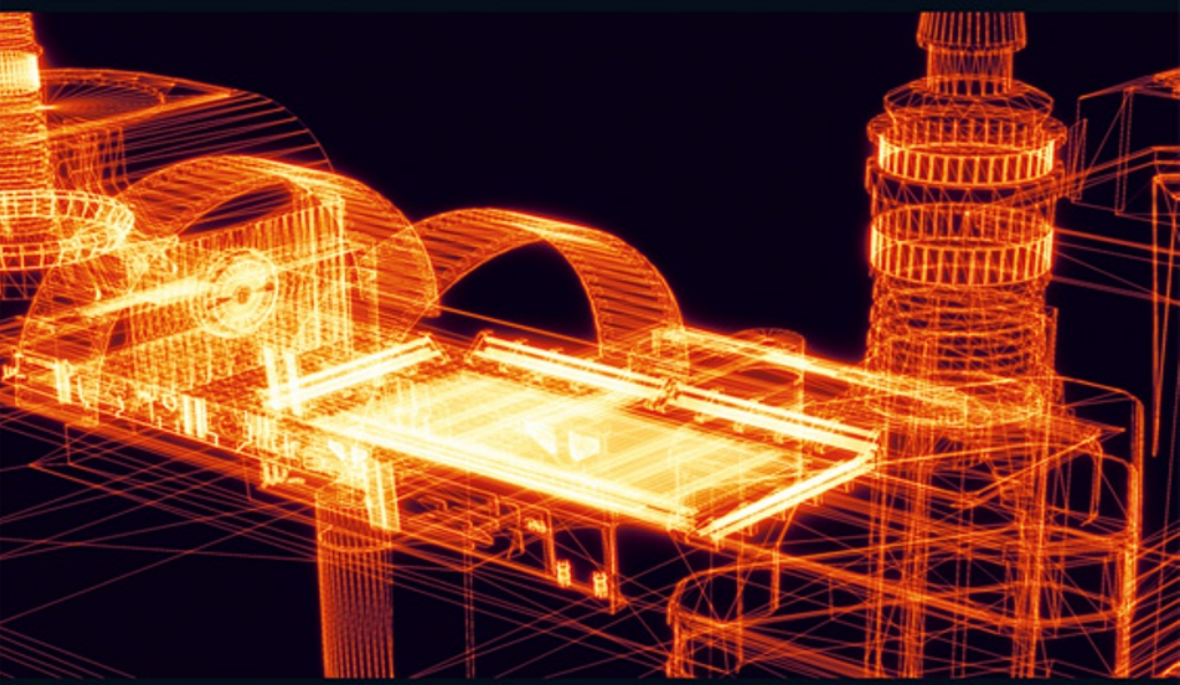
Building Information Modeling for a Smart and Sustainable Urban Space

Edited by
Rafika Hajji and Hassane Jarar Oulidi



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Preface

Multi-scale Building Information Modeling (BIM) has the potential to become a powerful decision support tool for urban planning. It can be used to facilitate many applications in various fields such as wind simulations, energy studies, noise studies and various types of analyses that require placing a planned architectural design in its context and being able to follow its implementation and evolution in an urban context, and connecting it with other urban components such as networks, road infrastructures, etc. The 3D urban model has become an essential support for better communication with all stakeholders on urban issues.

This book presents the theoretical and practical basis for implementing a multi-scale BIM. It addresses the issues of data acquisition, modeling, integration and information sharing in an interoperable framework. The book analyzes and provides the basics of BIM and Geographic Information System (GIS) integration in the context of urban management, a preliminary step to achieve the intelligent and sustainable management of an urban space. This book also presents practical case studies illustrating some aspects of using the concept of multi-scale BIM to address certain urban issues, including the segmentation of Light Detection and Ranging (LiDAR) data for BIM modeling, the integration of BIM and 3D GIS for property value simulations and the contribution of BIM and 3D GIS to urban renewal.

Rafika HAJJI
Hassane JARAR OULIDI
September 2021

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I dedicate this work especially to my husband for his support and encouragement. I thank him for the sacrifices he has made for me. Thank you for the joy and happiness you bring to my life.

Rafika HAJJI
September 2021

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Hassane JARAR OULIDI
September 2021

List of Acronyms

ADE	Application Domain Extension
AEC	Architecture/Engineering/Construction
AIA	American Institute of Architects
AR	Augmented Reality
B-Rep	Boundary Representation
BDS	Building Description System
BIM	Building Information Modeling
BMLS	Backpack-Mounted Laser Scanners
bSI	buildingSMART International
CAD	Computer-Aided Design
CIM	City Information Modeling
CNN	Convolutional Neuron Network
CPM	Critical Path Method
CSG	Constructive Solid Geometry

DARCES	Data-Aligned Rigidity-Constrained Exhaustive Search
DBMS	DataBase Management System
DEM	Digital Elevation Model
DL	Deep Learning
DM	Dense Matching
DSM	Digital Surface Model
DTM	Digital Terrain Model
ETL	Extract, Transform, Load
FME	Feature Management Engine
FoV	Field of View
GIS	Geographic Information System
GLIDE	Graphical Language for Interactive DEsign
GLoD	Geometric Level of Detail
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HBIM	Historic Building Information Modeling
HMLS	Hand-held Mobile Laser Scanner
IAI	International Alliance for Interoperability
ICP	Iterative Closest Point
IDBE	Integrated Digital Built Environment
IDM	Information Delivery Manual

IFC	Industry Foundation Classes
IFD	Information Framework for Dictionaries
IMU	Inertial Measurement Unit
ISO	International Organization for Standardization
ISPRS	International Society for Photogrammetry and Remote Sensing
KML	Keyhole Markup Language
LiDAR	Light Detection And Ranging
LoA	Level of Accuracy
LoB	Line of Balance
LoD	“Level of Detail”/“Level of Development”
LoGeoRef	Level of GeoReferencing
LoI	Level of Information
ML	Machine Learning
MMS	Mobile Mapping System
MNO	Modifiable Nested Octree
MVD	Model View Definition
MVS	Multiple View Stereovision
NIBS	National Institute of Building Science
NURBS	Non-Uniform Rational Basic Spline
OGC	Open Geospatial Consortium
RANSAC	RANdom SAmple Consensus