

# SpringerBriefs in Computer Science

## *Series Editors*

Stan Zdonik

Peng Ning

Shashi Shekhar

Jonathan Katz

Xindong Wu

Lakhmi C. Jain

David Padua

Xuemin Shen

Borko Furht

V. S. Subrahmanian

Martial Hebert

Katsushi Ikeuchi

Bruno Siciliano

For further volumes:

<http://www.springer.com/series/10028>

Grega Jakus · Veljko Milutinović  
Sanida Omerović · Sašo Tomažič

# Concepts, Ontologies, and Knowledge Representation

 Springer

Grega Jakus  
Sanida Omerović  
Sašo Tomažič  
Faculty of Electrical Engineering  
University of Ljubljana  
Ljubljana  
Slovenia

Veljko Milutinović  
School of Electrical Engineering  
University of Belgrade  
Belgrade  
Serbia

ISSN 2191-5768  
ISBN 978-1-4614-7821-8  
DOI 10.1007/978-1-4614-7822-5  
Springer New York Heidelberg Dordrecht London

ISSN 2191-5776 (electronic)  
ISBN 978-1-4614-7822-5 (eBook)

Library of Congress Control Number: 2013939045

© The Author(s) 2013

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed. Exempted from this legal reservation are brief excerpts in connection with reviews or scholarly analysis or material supplied specifically for the purpose of being entered and executed on a computer system, for exclusive use by the purchaser of the work. Duplication of this publication or parts thereof is permitted only under the provisions of the Copyright Law of the Publisher's location, in its current version, and permission for use must always be obtained from Springer. Permissions for use may be obtained through RightsLink at the Copyright Clearance Center. Violations are liable to prosecution under the respective Copyright Law. The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

While the advice and information in this book are believed to be true and accurate at the date of publication, neither the authors nor the editors nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Printed on acid-free paper

Springer is part of Springer Science+Business Media ([www.springer.com](http://www.springer.com))

# Contents

<b>1 Introduction</b> .....	1
1.1 Introduction .....	1
References .....	3
<b>2 Concepts</b> .....	5
2.1 Definition .....	5
2.1.1 Explicit Concept Definitions .....	6
2.1.2 Implicit Concept Definitions .....	9
2.2 Organization .....	11
2.2.1 Relationships Among Concepts .....	12
2.2.2 Graphical Organizations .....	14
2.2.3 Specific Organizations of Concepts .....	15
2.3 Concept Use .....	19
2.3.1 KeyConcept .....	20
2.3.2 Automated Generated Thesaurus Approach .....	21
2.3.3 Semantic Web .....	22
References .....	25
<b>3 Ontologies</b> .....	29
3.1 Definition .....	29
3.2 Organization .....	31
3.2.1 Ontology Components .....	31
3.2.2 Types of Ontologies .....	31
3.2.3 Languages, Tools and Methods for Organizing Ontologies .....	32
3.3 Ontology Use .....	34
3.3.1 Software Agents .....	34
3.3.2 Natural Language Processing .....	36
3.3.3 Media Content Annotation .....	40
3.3.4 Knowledge Extraction .....	42
References .....	44

- 4 Knowledge Representation . . . . . 47**
  - 4.1 Definition of Knowledge . . . . . 47
  - 4.2 Representing and Organizing Knowledge . . . . . 49
    - 4.2.1 Knowledge Representation . . . . . 49
    - 4.2.2 Knowledge Organization . . . . . 51
  - 4.3 Knowledge Use . . . . . 54
    - 4.3.1 Knowledge Acquisition . . . . . 55
    - 4.3.2 Knowledge Modeling . . . . . 55
    - 4.3.3 Reasoning . . . . . 57
    - 4.3.4 Applications of Knowledge-Based Systems . . . . . 58
  - References . . . . . 60
  
- 5 Trends and Outlook . . . . . 63**
  - References . . . . . 66